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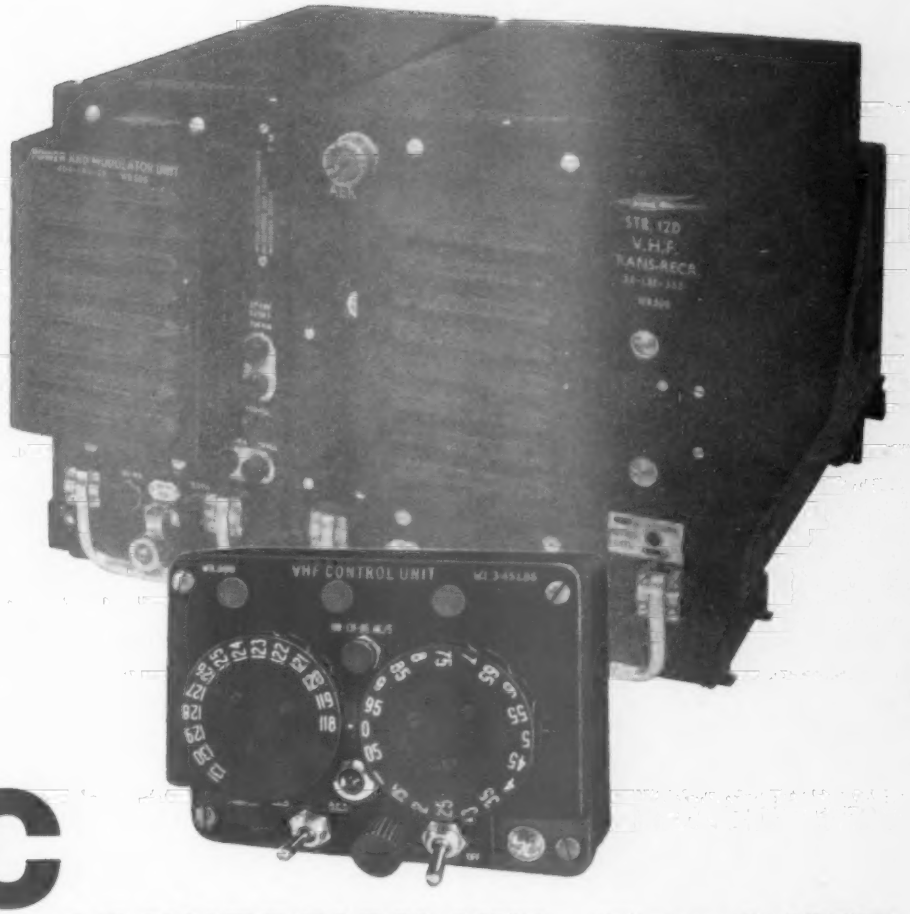

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The A.1207 Conversion Kit has been purchased by The British Overseas Airways Corporation for modifying their STR. 12-C and D equipments.

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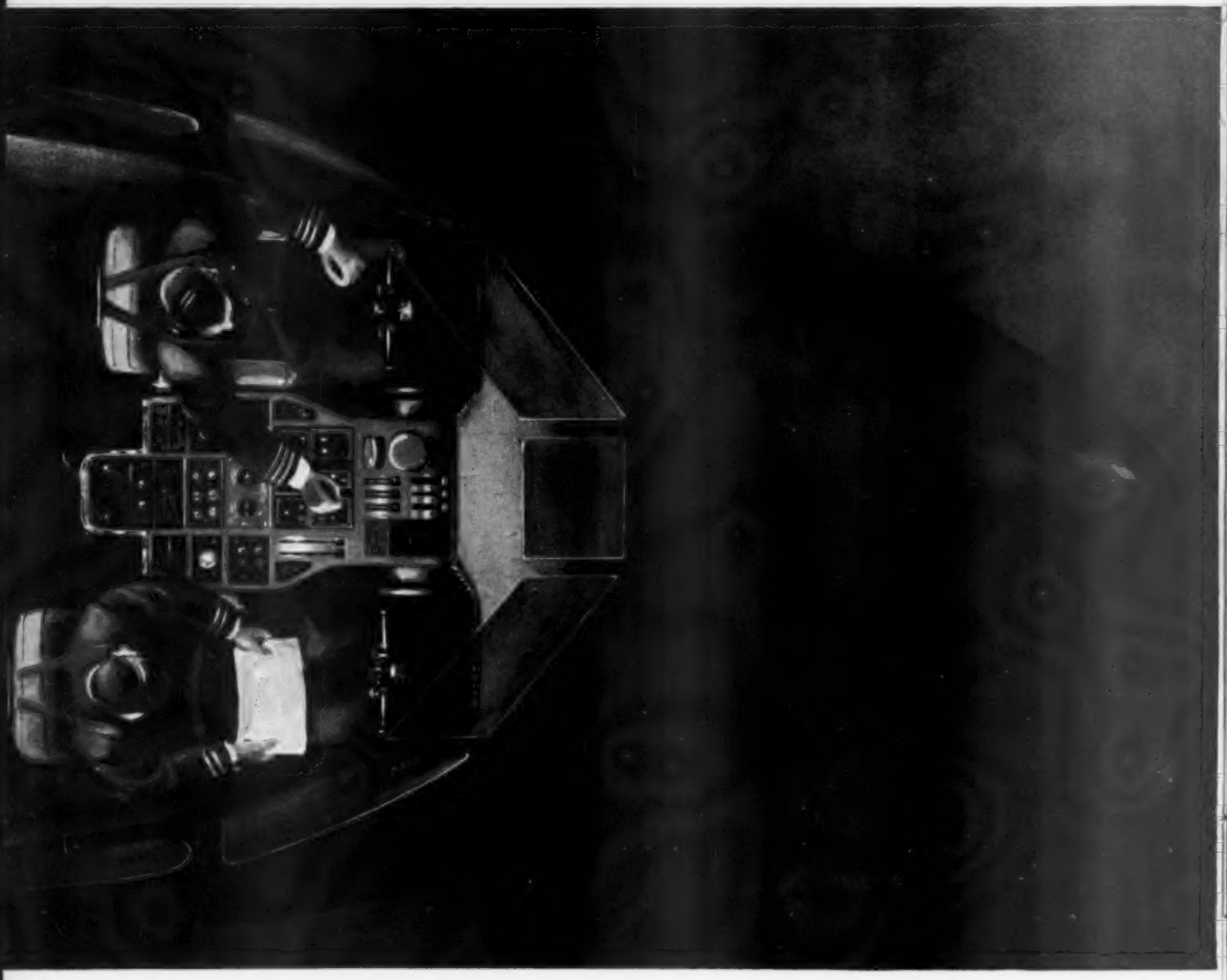
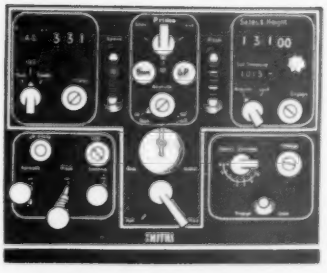
A

SMITHS have a down to earth



In the automatic control and the fully automatic landing of aircraft, SMITHS lead the world. SMITHS Flight Control System is the only system in the world designed as a single entity to provide full automatic control through every phase of flight, including the landing manoeuvre. SMITHS Flight Control System, including Multiplex autopilot, is specified for the de Havilland Trident when it enters service for BEA. In matters of flight control and instrumentation the *automatic* choice is SMITHS.



approach . . . *automatically*

Here is a brief factual report of SMITHS achievements in this field up to the beginning of this year :

SMITHS have been making automatic pilots since 1933.

SMITHS designed and made the first British electrically operated automatic pilot.

SMITHS designed and made the automatic pilot used in the world's first turbo-jet and turbo-prop airliners.

SMITHS automatic pilot (and associated equipment) is the heart of the world's first *fully automatic landing equipment* to go into production. This is the 'Autoland' system, in the design of which SMITHS collaborated closely with the Blind Landing Experimental Unit of the Royal Aircraft Establishment. The 'Autoland' system has been adopted by the Royal Air Force.

SMITHS automatic landing equipment has, in the last ten years, carried out more successful automatic landings than *all* other known systems in the world added together.

SMITHS embarked five years ago on a new generation of automatic pilots, designed to increase the safety factor to a level that will meet the stringent safety requirements that the civil air lines need for automatic landing.

SMITHS latest-generation automatic pilots will be the heart of the automatic system to be fitted in the de Havilland 'Trident' (under construction for BEA) and the Short 'Belfast' heavy freighter (on order for RAF. Transport Command). Negotiations are in progress with other operators.

SMITHS automatic landing equipment has been ordered by the USA. Federal Aviation Agency for evaluation tests in America.

The Flight Controller carries the switches and controls necessary for setting up automatic pilot and flight director modes and facilities. It is conveniently situated in a horizontal position behind the throttle pedestal. This unit has been designed for ease of operation and is unique in that the layout of the controls and indicators corresponds to the basic 'T' presentation used on the pilot's instrument panel.

AV 501

SMITHS AVIATION DIVISION

The Aviation Division of S. Smith & Sons (England) Ltd

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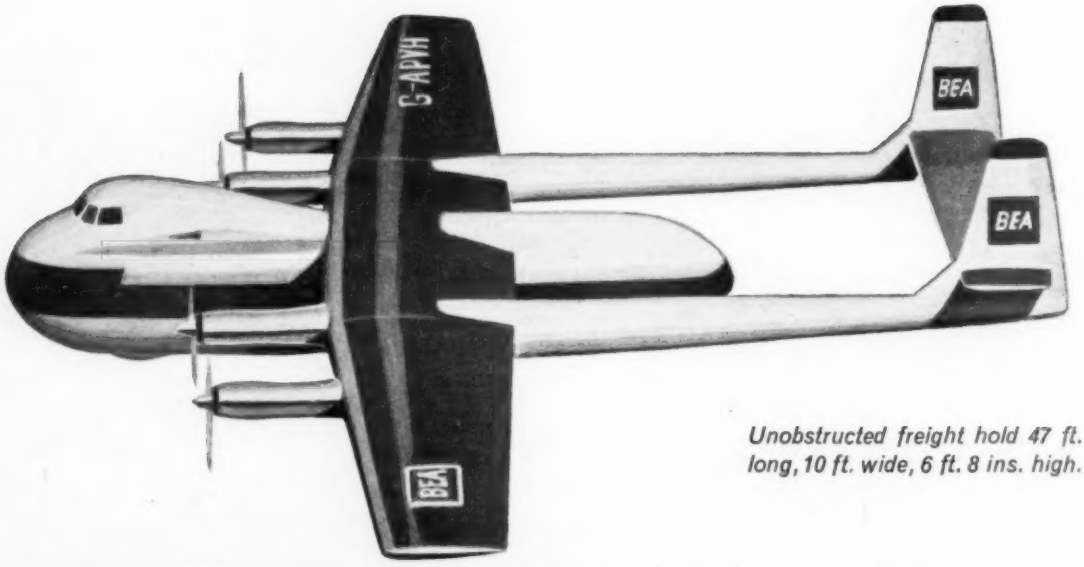

Unobstructed freight hold 47 ft. long, 10 ft. wide, 6 ft. 8 ins. high.

The Armstrong Whitworth Argosy, powered by Rolls-Royce Dart engines, will be delivered to British European Airways this autumn.
Carrying heavier and bulkier loads, the Argosy has been designed for simultaneous double-end loading with the Rolamat cargo handling system.
BEA Argosies will be operating to give manufacturers and exporters in Europe an even better air freight service.

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THE AEROPLANE and ASTRONAUTICS

VOLUME 101 NUMBER 2599 AUGUST 10, 1961

Setting up the L.A.A.

Our editorial of Jly. 27 last, welcoming the attitude of the Select Committee on Estimates with regard to the establishment of an Airport Authority, posed the question of how many years ago it was since first we began arguing the case for such a body in our editorial pages. We were therefore interested to have another date given us, namely Dec. 17, 1957, when a letter on the subject, advocating a statutory authority to run London Airport, appeared in *The Times*. It was from the pen of Mr. Dennis H. Handover, whose experience of civil aviation goes right back to the days of 1920 when he was commercial manager of the Instone Air Line.

This early reference to the subject by so experienced a civil aviation man is of special interest in this week of August, 1961, seeing it is only a few days since Mr. Thorneycroft announced the Government's plans to do just this very thing. Let us say right away that although not everybody in the game is satisfied that the White Paper on the Authority goes far enough, it is certainly the right sort of beginning.

The Government's first care must be that the men invited to join the board of the Authority are those who have experience of civil aviation. Many pioneer members of the Royal Air Force have done splendidly for military aviation and their service, but it is vital that any appointments to the new board shall be of those who have had a long working experience of what airline operators need. This experience needs to be fortified and supported by men with business acumen. Men who have shown by their commercial successes that they understand how to make a business pay.

Mention is made in the White Paper of arranging for an agency to run certain of the aerodromes. This is a scheme which is already working. International Aeradio provides services at some 40 aerodromes around the World. An example of the extreme economy with which this can be done is shown by the I.A.R. staffing at the London heliport.

We do not propose to discuss the proposals in the White Paper in any detail as that has been done on p.148.

The new Authority is going to start off in a not exactly warm climate, so far as future planning is concerned, bearing in mind Government pressure to hold down expenditure on new projects. Yet now is the time when the new Airport Authority must be free to look at the future and decide what needs to be done to meet foreseeable expansion.

Competition with teeth in it

News that the first de Havilland Trident, the D.H. 121, has been rolled out of its hangar will come as an invigorating surprise to many. To those who are building aircraft in direct competition with it, its unheralded appearance provides effective reminder that the de Havilland Enterprise, now part of Hawker Siddeley Aviation, has lost none of its ability to develop new aircraft surprisingly quickly. Its elegant lines, well brought out in the first photographs, some of which are appearing in this issue, will be closely studied.

It is, of course, a capacious aeroplane, and can seat six abreast in its 12-ft.-diameter fuselage. Combined with this roominess is a normal operating-limit Mach number of 0.875 with easy use of 6,000-ft. runways. The B.E.A. Trident is expected to produce a direct seat-mile cost of 1d. on stages of 700 miles. It is clearly going to appeal to carriers other than B.E.A.

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Matters of Moment

Riddle, Mystery and Enigma

ELSEWHERE in this issue we return, at some length, to the recent Soviet air display at Tushino, and the stimulating technical revelations that were made there. With some of the best photographs available of the aircraft taking part, we have attempted to marshal the known facts about the new types, frugal as these are, although we have not set out to discuss the significance to the Western world of the advanced military designs.

It now seems clear that the over-optimistic nature of the notorious 1957 Defence White Paper, which largely dismissed the immediate future of manned aircraft almost entirely in favour of missiles, has done us a greater disservice than could have been envisaged even by its most vociferous critics at the time of publication. While Mr. Khrushchev carried the ball along by his many public declarations that the Soviet forces were becoming virtually entirely missile-armed, the aircraft that were shown recently at Tushino must have been at relatively early stages of development before their introduction into wide-scale service.

We in Britain were to have no more manned fighters after the Lightning, and no more conventional bombers, while in the United States the B-70 supersonic bomber programme was strangled by Congress and the highly potent F-108 cancelled completely. By simple propaganda, and by refraining from showing any military aircraft at all between 1956 and 1961, the Russians ensured a five-year loss of continuity in the military aircraft development programme of the Western allies, which will be extremely difficult to make up.

Western ideas of Russian technology will also have to be revised yet again, since it has proved strong enough to support a vast missile programme as well as allowing continued concentration on manned military aircraft. The latter activity more than likely indicates, in addition, a trend in Russian political policy to rely on conventional forces with non-nuclear weapons in order to take the cold war a stage further without involving a total conflagration.

Whatever the political circumstances, and wherever the staging of a crisis might be—in Berlin, the Middle East, one of the African States, or perhaps Cuba—the Russians can call on the right weapons for the job, of most up-to-date design, and in appreciable numbers. There must be many lessons for the West in these unpalatable facts.

Smiths Reorganize

ON Aug. 7 Smiths Aviation Division came formally into being as a new division of S. Smith and Sons (England), Ltd. The four subsidiary companies—which now cease to trade as separate organizations, their activities being embraced in the new division of the parent company—are: Smiths Aircraft Instruments, Ltd.; Kelvin and Hughes, Ltd.; Waymouth Gauges and Instruments, Ltd.; and Kelvin and Hughes (Aviation), Ltd. All are manufacturers of aviation instruments and associated equipment. Undertakings of the subsidiaries mentioned are transferred to the parent company.

In announcing the new division Smiths state that "the co-ordination of the long-established and specialized technical resources and facilities of the original companies will bring about a rationalization of activities which will ensure that Smiths are as well placed as any comparable organization to provide the aviation industry with the instrumentation it needs. Moreover, all the executives and staff of Smiths Aviation Division are the same which served the original companies, so that the highly valued personal relationship now existing will not only continue but be strengthened by the improved service which this new division will be able to provide."

The division has a managing board composed of Mr. R. Gordon-Smith, chairman; Mr. L. A. Morgan, director and general manager; Mr. A. M. A. Majendie, director and deputy general manager; Mr. L. C. Harman, administration director; and Mr. K. Fearnside, technical director. Mr. D. G. Johnson has been appointed chief technical sales executive, now responsible for all sales and contract matters; Mr. R. E. Leete succeeds Mr. Johnson as contracts manager. Administrative, executive and technical sales headquarters are at Kelvin House, Wembley Park Drive, Wembley, Middx.

Air Matters in Parliament

Supersonic Airliner—Engines and Facilities

AT Question Time in the House of Commons on Jly. 31 MR. G. R. CHETWYND (Lab., Stockton-on-Tees) asked the Minister of Aviation whether he has yet awarded a design study contract in respect of engines for a supersonic airliner. MR. PETER THORNEYCROFT replied that no contract has yet been awarded, but that proposals, received both from Rolls-Royce and from Bristol Siddeley, are under consideration.

To Mr. Chetwynd's suggestion that, inasmuch as the contract for the airframe was let nearly a year ago, it is now high time to let that for the engine, so that the project can march forward "in one piece," Mr. Thorneycroft reminded the House that the airframe contract already placed was for a design study and not for a design proper; he agreed that a corresponding design study for engines is important, and stated that in fact international discussions are now going on as to the most suitable type of engine. He added: "I think we have probably been prudent to wait until now."

The latter point may be well taken—but, having regard to (a) the unreliability, exemplified over and over again, of any prediction as to the length of time required to clear a new engine design of inborn operating snags, and (b) the extent to which aero-engine manufacturers are already committed, it is to be hoped that work will be put in hand early enough to prevent a promising new design of aircraft being kept on the ground for lack of properly developed prime movers.

MR. J. RANKIN (Lab., Govan) inquired what airport facilities exist for operation of a supersonic airliner, to which Mr. Thorneycroft said that certain facilities are available and that designs should aim to keep within their compass. Mr. Rankin went on to ask the Minister if, in view of its tremendous importance to the aircraft industry, he would now frankly declare his intention, or otherwise, of going ahead with the project of a supersonic airliner, apart from results of consultations with foreign powers or of design studies. But Mr. Thorneycroft declined to snap at this well-baited hook, remarking simply that it would be no good manufacturers producing "some monstrosity which requires 20,000 ft. to take off," but that what was required was something which conforms to ground conditions as they are.

Blackbushe Airport's Future

Later on the same day SIR E. ERRINGTON (Cons., Aldershot) asked the Minister of Aviation what replies he has given to those who have applied to him to use the whole or part of Blackbushe aerodrome for flying purposes, and what is his policy in this respect. MR. GEOFFREY RIPPON, Parliamentary Secretary to the Ministry of Aviation, who replied, said: "The Minister has expressed his support for the proposed use of the western part of Blackbushe aerodrome as a private aerodrome for small, private and club aircraft."—O. W. H. Cooke.

HENLOW GRADUATION.—At a recent graduation parade at the R.A.F. Technical College, Henlow, the Secretary of State for Air, Mr. Julian Amery, presented the awards and toured the college. He is seen here with (right to left) Air Marshal Sir Wallace Kyle, Air Commodore N. Rutter (now Air Vice-Marshal) and Air Marshal Sir Arthur McDonald.

Trident Roll-out

The first of the second-generation turbojets—the de Havilland 121 Trident short-haul airliner—was rolled off the assembly line at Hatfield on Aug. 4. It is due to start flight trials later this year and six more Tridents will join the test programme in 1962 for a certification target date of early 1963 and delivery to B.E.A. during that year. These pictures—the first to be published of the Trident—show the naturalness of the "new-look" layout.

Twenty-four Hours in Space

IN two confident steps, the Russians have demonstrated their ability to place men in orbit and return them to Earth under the most exacting conditions. From one orbit of the Earth on Apr. 12, it has now been possible to extend the flight to more than 17 orbits and the flight duration from 108 minutes to 25 hr. 18 min. The total distance covered was nearly 435,000 miles for the latter mission, which almost equals a two-way flight to the Moon.

The fact that a second man had been placed in orbit was announced by Moscow Radio at breakfast-time last Sunday morning. The statement ran:

"On Aug. 6, 1961, at 9 a.m. Moscow time, the Soviet Union launched a new spaceship, Vostok II, on a round-the-Earth orbit. Spaceship Vostok II is piloted by Soviet Citizen Cosmonaut Major Gherman Stepanovich Titov.

"According to preliminary data the spaceship has been put into an orbit close to the calculated one, with the following parameters: maximum distance from the surface of the Earth (at perigee) is 110.6 miles—maximum distance (at apogee) is 159.7 miles. The inclination of the orbit to the equator is 64° 56'. The initial period of revolution of the spaceship is 88.6 minutes.

"Two-way radio communications are maintained with Cosmonaut Titov. The cosmonaut is transmitting on frequencies of 15.765 Mc/s., 20.006 Mc/s. and 143.625 Mc/s. A signal transmitter, operating on a frequency of 19.995 Mc/s., is also on board the spaceship. The systems on board sustaining the cosmonaut's vital activity are functioning normally." Major Titov's many tasks while in orbit included testing the orientation controls manually; he reported that they responded well. Total weight of the vehicle was given as 10,430 lb.

As in the case of Major Gagarin's single-orbit mission on Apr. 12, the launching was made from the "cosmodrome" at Baikonur, which is located north-east of the Aral Sea. The return was made in the district of Saratov, some 440 miles south-east of Moscow, near the place where Vostok I landed. After making one orbit of the Earth, it was the Earth's axial rotation within the orbit of Vostok II that determined how many orbits Major Titov would complete and when he would land. As explained in the article, "Man's First Orbit in Space" (THE AEROPLANE AND ASTRONAUTICS, Apr. 20, 1961, p. 435), because of the Earth's eastward rotation, the launching point is displaced to the east to the extent that, if recovery were attempted after one and within 17 orbits the vehicle would not return to the appointed landing place. To bring the Saratov recovery area back into correct alignment with the spacecraft's orbit, the vehicle had to spend more than 24 hours in space.

It is of interest to recall that the Russians performed precisely the same orbital flight in August last year when the two dogs, Strelka and Belka, were kept in space for more than 24 hours in Spacecraft II. This vehicle performed more than 17 orbits and the animals were safely recovered following the vehicle's re-entry into the atmosphere by means of an ejectable capsule which landed by parachute. It appears that Major Titov remained in the pressure cabin all the way to the ground—as did Major Gagarin in Vostok I.

More pictures of the Vostok spacecraft—including the first to show the arrangement of the ejector couch within the cabin—are on pages 145 and 146.

OPtional Reading—6

THE aviation industry, as might be expected of it, has taken to automation as a duck to water. On the ground we have seen automatic accounting systems, at first established as a purely accountancy measure and now extending into the field of bookings; in the air we have had some degree of automation ever since the first automatic pilot (when, I wonder?—in the Heyford?) and we have seen this extend to automatic pressurization, automatic fuel trimming, automatic height locks, etc. Is there an end to this process?

In the ordinary activities of man one would at once say, no: man will get out of his activities—or most of them—if he can and give them over to a machine. But at this point it is relevant to ask: is there a dividing line beyond which man is not prepared to leave a particular activity or class of activity to a machine? For example, in the field of medical diagnosis it is quite probable that a computer could be devised to accept punched cards, the patient merely selecting his various symptoms from a list, feeding the card into the machine together with a second card giving his age and other fixed data, and drawing out the prescription at the other end.

Now this would obviously save a lot of valuable time on the part of the general practitioner and also a lot of surgery waiting on the part of the patient; if the machine were developed one stage further so as actually to make up the prescription, there would be an even greater saving. But I have a feeling that even the most harassed G.P. would object and that the patient would not take kindly to the idea either. And, if we ask ourselves why, we may be on the road to answering our question as to whether the aviation industry is likely to find a limit to automation, or at least some "reserved areas."

This is a question which must be answered now, in 1961, since we will have B.E.A. operating auto-flare with the D.H. 121 and progressing thence forward towards fully automatic landing. We also have the Ministry of Aviation experimenting with an automatic computer for the acceptance of operational flight plans (for installation at London in 1964) —clearly a step in the direction of automatic air traffic control. But if there are to be "reserved areas" (as in medical diagnosis) into which automation will not be acceptable to the professional, or tolerated by the public, then it would be as well not to place too many eggs in the automatic basket.

It is my belief that there are such "reserved areas" and that they are not too difficult to define. The above medical analogy does, indeed, give us the answer: a professional group responsible for human life will not delegate its responsibilities entirely to a machine. Similarly, the ordinary public will not trust its life entirely to a machine. Will anyone quarrel with either of those viewpoints?

Think of a mid-air collision, resulting in the loss of a hundred lives; the inquiry reveals clearly that the operative A.T.C. computer had developed a fault, the first standby circuit was under maintenance and the second blew a fuse on taking up the load; meanwhile the radar man could see the collision coming but, lacking the basic data, could only say: "Look out!" Or think of the landing accident in which the triplicated automatics were in fact working perfectly; however, the aircraft burst a tyre and ran off the runway; the pilot (if any) could see all this, but as he had less than the minimum visibility required to keep the aircraft straight, could take no effective action. In both these cases automation would be acceptable if, at the first hint of irregularity, the controller or the pilot could instantly and faultlessly take over. In other words, he has to have been in the loop all along, trained as it were to concert pitch, reading a separate score and fingering his keys so that at once he can come in with his part.

But more than that: the part he has to play must be within his own competence, not that of the perfectly functioning machine. This is the point on which many an airline programme for lower minima will break: an all-out drive (which at least half a dozen airlines are now making) can improve auto-coupler maintenance, feed better cross-wind control into the flight director, tighten up the ILS beam and so on, but unless the pilot has been able to follow the past manœuvres (read the past score), has been trained to execute the future manœuvres (read and play the next part of the score), neither he nor the public will accept the operation—at least not after the first accident, and that almost regardless of the alibis on behalf of the equipment.

Similarly, unless the radar man, sensing an imminent risk of collision, can take over and offer immediate advice on a course of action, his computer will be more of a nuisance to him than it is worth. This, indeed, is the conclusion reached at the informal discussion between European states, held in Paris early this year. The report reads:

> ". . . it was indicated that it would be necessary to provide for duplication of the more essential parts of the equipment such as the computer, thus limiting failures to what was referred to as 'fail-softly' cases, i.e., that only certain parts of the equipment were likely to become unserviceable at any given time so that only part of the functions performed by the equipment would have to be taken over by human controllers.
>
> "By careful planning of the equipment and appropriate distribution of back-up equipment within the entire automatic system, it should thus be possible to keep the effects of failures within such proportions as would permit controllers to maintain the operation of the entire A.T.C. system at an acceptable level while the fault existed."

All this is not to say that absolute automation is impossible. In terms of pure engineering the industry has a choice. In the case of the Russian space flight it appears that absolute automation was accepted; but in the American flight the pilot is reported to have retained control. However, we are not all of astronaut calibre and the industry might do well to consider human reactions very carefully before it goes too far towards automation in the important areas of A.T.C. and manœuvres near the ground. Fortunately it has shown an awareness that engineering considerations are not everything; otherwise why did the whole of the group at the recent IATA Supersonics Symposium accept the necessity of windows?—C.C.J.

Publications Received

Flight Briefing for Pilots. Vol. 1, by A. H. Birch and A. E. Bramson. A valuable new handbook for student pilots under training, for pilots taking the Flying Instructor's Course and for private pilots who need a "refresher." This volume, which has been considered, approved and recommended by the GAPAN Panel of Examiners, is concerned with flying up to PPL standard; a later volume will contain more advanced exercises. 184 pp. Illustrated. 4½ in. by 7 in. Sir Isaac Pitman and Sons, Ltd. 15s.

Long Range Ballistic Missiles, by Eric Burgess. A study of all the many aspects which together make up an intercontinental ballistic weapon system, including much factual material on early German and American work and the U.S. ICBMs of today. 260 pp., 5½ in. by 8½ in., illustrated. Chapman and Hall, 35s.

Aircraft Electrical Practice. A handbook for students and for engineers concerned with the design, construction, operation and maintenance of aircraft electrical systems. The author was formerly lecturer in aircraft power systems at the College of Aeronautics. 320 pp., 5½ in. by 8½ in., illustrated. Odhams Press, Ltd., 45s.

Fifty Years of British Air Mails, by N. C. Baldwin. A new volume in the series of Aero Field Handbooks, this title is issued to commemorate the jubilee of British Official Aeroplane Mails and covers 75 significant events. 48 pp. 5½ in. by 8½ in. Illustrated. Francis J. Field, Ltd. 10s.

The Wrong Side of the Sky, by Gavin Lyall. A first novel with itinerant flying in the Middle East as the background to an exciting plot. 252 pp. 5 in. by 7½ in. Hodder and Stoughton, Ltd. 15s.

Always Another Dawn, by A. Scott Crossfield (with Clay Blair Jnr.). An intimate and revealing account of the testing of rocket-propelled research aircraft at Edwards Air Force Base, from the X-1 to the X-15, and including the Navy Skyrocket, by the test pilot who has flown them all. 422 pp. 5½ in. by 8½ in. Illustrated. Hodder and Stoughton. 25s.

An Introduction to Space Travel, by P. E. Cleator. A volume in the Brompton Library series which outlines some early speculation and fictional description and goes on to provide a sound basic account of the present state of space travel art, and future possibilities and problems. 160 pp. 5½ in. by 8½ in. Illustrated. Museum Press, Ltd., 15s.

Aircraft Instruments, by C. A. Williams. A survey of aircraft general-purpose indicating instruments for use by airline instrument engineers, students and others professionally concerned with instrument design and construction. 240 pp., 5½ in. by 8½ in., illustrated. Odhams Press, Ltd , 35s.

Leads the Field, by Flg. Off. T. Mason. A history of No. 12 Squadron, R.A.F., from its formation in February, 1915, to operations as part of Bomber Command's commitment to NATO. Appendices list commanding officers, bases, aircraft types and brief histories of each individual aircraft on squadron strength. 88 pp., 5½ in. by 8½ in., illustrated. Copies for ex-members of the squadron (only) from Flg. Off. Mason, No. 12 (B) Squadron, R.A.F. Conningsby, Lincs, price 12s. 6d. post paid; copies for the public from Beaumont Aviation Literature, 2a Ridge Avenue, Winchmore Hill, London, N.21, price 17s. 6d. (plus 1s. postage).

With Gagarin into Orbit

First picture to show Major Gagarin on the couch of his ejectable capsule; he is presumably facing the instrument panels depicted in our issue of May 4, 1961, page 480. In his hands appear to be control switches, one of which may be for ejecting the capsule in emergency.

THE long-awaited colour documentary film of Major Yuri Gagarin's mission in the Vostok spacecraft is being released through A.B.C. cinemas at the end of this month. Originally shown in Moscow in July, the 45-minute, film will be screened in Britain under the title "With Gagarin to the Stars."

A brief note on the content of the film appeared in THE AEROPLANE AND ASTRONAUTICS on Jly. 27, together with two "stills" which showed the astronaut being placed in his ejectable capsule and also the assembly of two sections of the Vostok spacecraft.

According to Warner-Pathé, who are editing the film for British showing, the film opens "at the moment when the triumphant Gagarin arrives in Moscow, stepping from the aircraft to walk the length of a welcoming red carpet to report to Mr. Khrushchev. It goes on to tell of the selection and training of a band of Russian astronauts, and there are some shots of Gagarin at home with his family. Finally comes the moment of take-off. Gagarin is seen strapped into his capsule as the last moments of the count-down slip away. And then, the flight itself; the tension as the space rocket's course is plotted and followed at base; the wavering indistinct picture of Gagarin sent back from space itself; and the end of the journey, as he is picked up safely after the capsule has returned to Earth." More "stills" from the film are on this and the following page.

What new evidence has emerged from these—particularly concerning the launching rocket? The launching sequence includes a long-shot which purports to show the space booster ascending. The nose-configuration is in marked contrast to the heavily retouched picture released in Moscow on Apr. 14, but little detail is discernible of the overall vehicle. As the rocket moves away there is a "suspicion" of tail fins, as one of the pictures shows. An external conduit, presumably carrying control wiring for the guidance system is clearly visible. According to the official account of the flight by Major Gagarin, the nose cap is jettisoned after the initial boost phase.

Although the base of the rocket is not clearly seen in the pictures, the vehicle does not give the appearance of having multiple engines in its first stage and, indeed, in the absence of scale, one might be forgiven for thinking that the rocket depicted was the T-1 tactical missile which has been seen many times in Moscow anniversary parades.

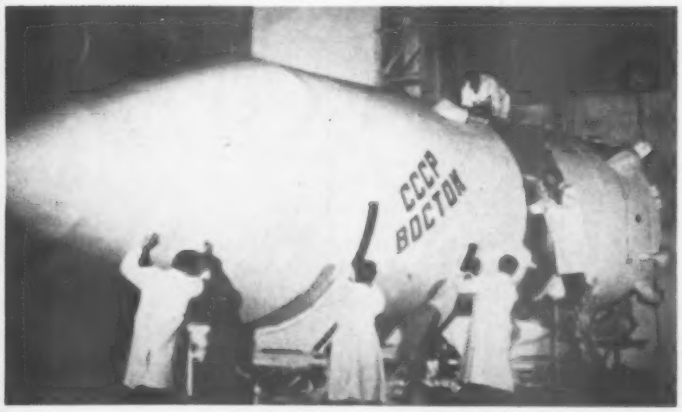
With electrodes attached to his head and body, Yuri Gagarin undergoes medical tests prior to his historic orbital mission of Apr. 12.

The latest Soviet article to mention the launching rocket is published in *Vestnik Akademii Nauk* (Journal of the Soviet Academy of Sciences). Prof. G. Petrovich writes that "with the high specific impulse of the six liquid propellent engines, it has been possible to attain a tremendous power with a relatively moderate consumption of fuel." He also notes that the carrier rocket has possibilities which are far from being exhausted. This *hints* at something better than LO_2/kerosene.

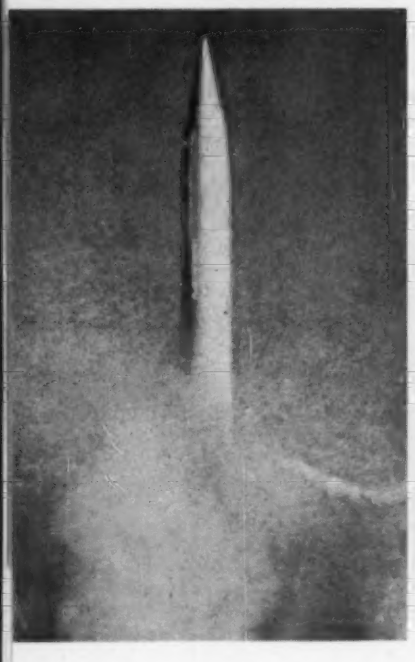
Of the Vostok itself, the same author observes that, after the landings of all four space ships (including the dog-carriers), the cosmonaut's capsules were in such good condition that they could be used again after small repairs to the outer coatings. He also states that the silver-coloured spaceship was "girdled at the waist" (at the junction between the capsule and the instrument compartment) with a green band—a coating with definite optical properties which helped to maintain the proper temperature during the space flight.

Another picture shows the two sections of the spacecraft.

(*Continued on page 146*).



This "still" shows the joining of the two main sections of the Vostok at a slightly earlier stage than that depicted in our issue of Jly. 27.



The rocket as it appears in the documentary film, "With Gagarin to the Stars" (left). (Below) The heavily retouched picture, released in Moscow on Apr. 14, alleged to show the nose of the Vostok launcher rising through cloud.

Looking up at the rocket as it departs. If the take-off has not been simulated, these pictures are the first to show the launching of a Russian satellite booster.

(*Continued from page 145*)

The complete satellite-spaceship, according to an official Soviet statement, consists of two main components: The *pilot's capsule*, with its accommodation for the pilot, the life-sustaining installations and the landing system; and the *instrument section* with the instruments working during orbital flight, and the retro-rocket. On the occasion of the launching of Spacecraft 1 on May 15, 1960, it was stated that the pressure cabin weighed 5,512 lb. and the instrument section 3,250 lb. With other equipment, this made a total orbital weight of 10,008 lb.

Despite a hint in *Red Star* on Jly. 14 that the film includes pictures of the recovery of the Vostok, we learn from Pathé-Warner that there are no scenes of the spacecraft landing.

The film can be seen at A.B.C. cinemas in the North-West London area in the week beginning Sept. 3; showings on the North-East and South London circuits will immediately follow. It will also be seen in provincial cinemas.—K.W.G.

Aviation News in General

LOCKHEED REORGANIZE.—Lockheed announce that in keeping with its growth and diversification it has strengthened the organization structure of three of its operating units. The California division becomes the Lockheed-California Company with headquarters at Burbank, the Georgia division is now the Lockheed-Georgia Company (Marietta) and missiles and space activities are now controlled by the Lockheed Missiles and Space Company (Sunnyvale, Calif.).

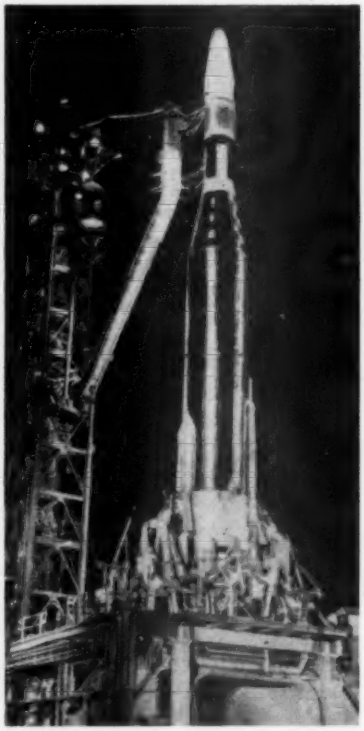
NEWS FROM CESSNA.—Production of the Bird Dog is to continue with an order for 70 L-19Es from the U.S. Army. First deliveries will be made next June. Since 1950 more than 3,000 have been built. Cessna has also delivered the first seven of a quantity of T-37Bs to the Peruvian Air Force.

S.A.R. SIKORSKY.—The U.S. Coast Guard service is to conduct a 60-day evaluation of a Sikorsky S-62 amphibious helicopter for its possible adoption as a search and rescue aircraft. Trials will include shipboard operation from an ice breaker.

NATIONALIST VOODOOS.—Reports that the Chinese Nationalists are operating RF-101C Voodoos from Formosa have been partly confirmed by a newspaper report last week that one had been shot down by Communist aircraft. This was over Fukien Province. The pilot was captured.

MORE MOJAVE MODS.—A further 30 Sikorsky H-37A Mojave helicopters are to be modified to H-37B standards (see p. 716 of our Jne. 22 issue) under a $3.1 million U.S. Army contract.

SAMPLING THE F-104G.—Eight Luftwaffe pilots are at present on a six-week tactical training course with F-104G Super Starfighters at Lockheed's Palmdale facility. On return to Germany they will act as instructors when this type is introduced into Luftwaffe service later in the year.



MAKING READY.—Preparing Atlas-Agena B for launching at Cape Canaveral. In its nose is the 675 lb. experimental spacecraft, Ranger I.

HUSKIE RECORD.—The F.A.I. has confirmed the helicopter weight-to-height record in class E.1 set up by a Kaman H-43B Huskie on May 25 (see p. 611 of our Jne. 1 issue). At the time of the flight the height was given as 25,814 ft. but this has now been revised to 26,369 ft.—nearly 1,900 ft. better than the previous record held by an Mi-4.

HILLERS FOR S. AMERICA.—Latest helicopter sales announced by Hiller are three 12Es and an E4 to Mexico, the latter for use as a presidential transport, three 12Es to the Colombian Air Force and an E4 to Ecuador.

HISTORY IN MODELS.—More than 1,300 aircraft models will be shown at Selfridge's department store, Oxford Street, London, W.1, from Aug. 28 to Sept. 9. The work of Mr. Peter Farrar of Torquay, all are to 1/72nd scale. Aircraft of the R.A.F. account for more than half the collection. Admission is free.

TURBOJET GIFT.—One of the two Rolls-Royce Derwent 8 turbojets which powered the private-venture ground-attack prototype of the Meteor has been presented to the North Gloucestershire Technical College, Cheltenham, by the Gloster Aircraft Co., Ltd. It has been "sectioned" and will be used for instructional purposes.

ASTRONAUTICS IN JAPAN.—The Third (1961) International Symposium on Rockets and Astronautics will be held in Tokyo from Aug. 28 to Sept. 1. Lectures will deal with: Propellents; Propulsion Systems; Vehicles (Aerodynamics, Structures, Astrodynamics, etc.); Instrumentation (Telemetry, Guidance, Tracking, Research, etc.); Space Sciences (Space-Physics, Space Communication, etc.); Space Medicine and Biology; and Space Law.

Commercial Aviation Affairs

CHEAPER LONDON-BELFAST.—B.E.A. is planning to introduce, subject to A.T.L.B. approval, a new off-peak cheap winter night tourist-class fare on the London-Belfast route of £3 3s. single from Nov. 1 next. The previous lowest rate was £4 3s. single for off-peak travel in April and May.

LINKING THE PORTS.—Air Safaris has received approval for its proposed services linking Liverpool, Glasgow, Edinburgh and Southampton. Operations are expected to start late this month or early in September, and the services will be timed to connect with passenger-liner arrivals and departures.

MARCONI FOR TRIDENT.—B.E.A. has specified the Marconi "Sixty Series" of radio and navigation aids for its fleet of 24 D.H. 121 Tridents. The equipment includes dual communications, dual ADF, dual comm. VOR/ILS and Selcal (selective calling system).

MORE PHILIPPINE F-27S.—Two more Fokker F-27 Friendships have been ordered by Philippine Air Lines—bringing the order total to 100 for the Netherlands factory. P.A.L. already operates two F-27s.

STATISTICS SOUGHT.—The A.T.L.B. has asked operators of inclusive tour services in the 1961 summer season, on B, C or D licences, to provide statistical data relating to these services. The data will be collected on a simple form and will include details on a monthly basis of the number of return flights authorised and operated, and the number of return seats authorised, operated and occupied.

A.R.B. TRAFFIC.—Latest provisional figures for the 12 members of the Air Research Bureau show an increase for June of 14% in total intra-European passenger-miles by comparison with the same month last year. Passenger load factor averaged 58.7% by comparison with 60.7% in June, 1960.

LUFTHANSA'S 10TH VISCOUNT.—On Jly. 31 Lufthansa took delivery of its 10th Viscount 814 (D-ANAC) at Hamburg Airport. One more Viscount is due to be delivered shortly to complete the fleet of 11.

K.L.M. POLAR JETS.—On Aug. 9 K.L.M. was due to operate its first turbojet Polar route service to Tokyo via Anchorage. The introduction of DC-8s on this service has awaited the availability of the turbofan Series 50 with its improved range performance.

NON-STOP TO GHANA.—The non-stop service between London and Accra (see the issue of Jne. 29, p. 742) is operated by Ghana Airways, using Britannia 309/319s, and not by B.O.A.C., whose Britannia 102s would not, in fact, be able to operate non-stop.

LONDON'S HELIPORT.—Members of the London County Council, including the chairman, flew in a B.E.A. Westland Whirlwind last week from Battersea to look at the three selected heliport sites (see last week's issue, pp. 124 and 126).

ROUTES WANTED.—Overseas Aviation has applied for a licence to operate on the route Jersey-Berlin, and Air Safaris is seeking approval for a a service from Birmingham and/or Coventry to Cologne/Bonn with optional stops at Rotterdam and Dusseldorf.

ALLISON OVERHAULS.—An inter-overhaul period of 1,800 hrs. has been approved by the F.A.A. for the Allison 501-D13 turboprops in Pacific Southwest and Western Airlines' Electras. This is the longest inter-overhaul period approved for any U.S. turboprop engine.

SCILLY SERVICE.—The A.T.L.B. has granted a B-class licence to Mayflower Air Services to operate a daily return service between Plymouth/Exeter/Newquay and the Scilly Isles for day return excursion passengers until Sept. 30, 1961. Return fares will be £5 10s. to £6 15s. from Plymouth and Newquay, and £7 7s. to £9 16s. from Exeter. D.H. Rapides will be used.

VETERAN SOLD.—The DC-3 (VR-HDA) with which Cathay Pacific Airways started initial operations in 1946, and the sole survivor of that era, has been sold to Royal Air Laos.

SABENA RESULT.—A deficit on operations in 1961 by Sabena of B.fr. 131.7 million (about £940,000) has been covered by an advance from the Belgian Government, repayable out of future profits. The loss is smaller by B.fr. 65 million than that recorded in 1960. The 1960 results were adversely affected by the Congo airlift from Jly. 9 to Jly. 28, and by the appropriation of B.fr. 75 million for depreciation of the piston-engined aircraft. Capacity ton miles increased by 22%, and load ton miles by 23% (excluding the Congo airlift).

MORE PIRACY.—On Aug. 3 a Continental Airlines' Boeing 707 on the Los Angeles-Houston service was "taken over" by gunmen supporters of the Cuban régime, was put down to refuel at El Paso, on the Mexican border, and was held there with hostages for eight hours before being "recaptured" by F.B.I. men and local police.

TOUCH AND GO.—A South African Airways Boeing 707 with 122 passengers and 12 crew touched treetops after take-off at Athens on Aug 2. The flight was continued uneventfully to Nairobi, where the aircraft was held for inspection. Damage was sustained in the port undercarriage area and to the starboard trailing edge.

News About People

SEATING SPECIALIST. — Newly appointed managing director of L. A. Rumbold and Co., Ltd., is Mr. F. H. Boyd-Carpenter, who was associated with the late Mr. Louis Rumbold in the formation of the company in 1932 and has been a director from that time. At the present time, the company states, it is busier than it has ever been on contracts for manufacturers and operators. A very large proportion of the orders are for export.

SERVICE STRENGTH.—Replying to a question in the Commons recently, the Secretary of State for Air, Mr. Julian Amery, gave the active strength of the R.A.F. on Jan. 1, 1961, as: Officers, 22,374; Airmen and Airwomen, 139,512.

CORK AIRPORT.—Mr. Tadhg Lynch has been appointed station superintendent for Aer Lingus at the new Cork Airport, which is due to be opened on Oct. 16. He joined Aer Lingus at Shannon in 1946.

RETIRING.—With a lifetime in commercial air transport behind him, Mr. Wilfred E. Clark, latterly a specialist consultant with Vickers-Armstrongs (Aircraft), mainly on the VC10, has now retired. After serving with the R.F.C. and R.A.F. he joined Aircraft Transport and Travel, Ltd., in 1919 as a licensed ground engineer. Then followed service with Instone Airlines, Imperial Airways, B.O.A.C. and Airwork over a period of 34 years. He joined Vickers in 1956.

MR. B. STEVENS.—Thorn Electrical Industries, Ltd., announce the death of Mr. B. Stevens, chief engineer of its special products division. In this position he was closely concerned with the development of the Thorn-Plasteck instrument panel lighting system and the R.A.E.-Thorn visual glide path indicator.

SHORT HAND-OVER.—Latest recruit to the ranks of executive operators is Davy-Ashmore, Ltd., of Sheffield, who have acquired a Queen Air through Short Brothers and Harland, the U.K. Beechcraft distributors. Mr. M. A. Fiennes (right), received the aircraft documents from Mr. D. Keith-Lucas, Short's technical director, at Ringway on Aug. 1.

Air Transport

Autonomous Airport Authority Approved

London's airports and Prestwick to be managed by an independent Authority: other principal airports to be handed over to local authorities: a separate levy for A.T.C. and associated services.

THE principal features of the Ministry of Aviation's new policy* in the management of airports and the provision of technical services are these:—

An autonomous Airport Authority will be set up to own and to manage London's airports—Heathrow, Gatwick and Stansted—and Prestwick. Seven other principal State-owned airports will be handed over to the local authorities—with financial assistance as and where this is justified. The nine "Highlands and Islands" aerodromes in Scotland, and those in the Scillies, may be managed by a subsidized agent—which might possibly be B.E.A.

All technical services—i.e., A.T.C., navigation aids, communications, meteorological services, and approach and landing aids (where appropriate)—will remain the responsibility of the Ministry. A separate levy will be charged on airline and other operators for the use of these services, whether en route or otherwise.

The new Airport Authority and (eventually) the local authorities will thus be responsible, in the main, simply for the operation and management of the airports and the ground services, and landing fees will be charged accordingly. Charges for the overall A.T.C. services will be made separately and the aim will be to increase the fees progressively until the cost is borne entirely by the civil aviation industry and, presumably, the military authorities.

It is logical enough that the Ministry should retain control of the technical services since there must inevitably, for overall safety, be an increasing degree of co-operation between civil and military A.T.C. and between the controlling authorities in the U.K. and on the continent of Europe. This, too, is one sector of the Ministry operations about which there have been no complaints—except, perhaps, in relation to the need for rationalized civil/military co-ordination.

The Authority cannot come into being quickly; legislation will be required for the take-over and it will probably be 1963-64 before the system is in operation. Meanwhile, the Ministry will carry on with new projects—though there may well be a natural tendency to "leave it to the Authority"—and will negotiate with the local interests.

In detail, the main proposals are:—

Aerodromes. An Airport Authority will be set up to own and manage the four main international airports and to plan, build and manage any new airports which are eventually required. These airports are: London (Heathrow), London (Gatwick), Stansted and Prestwick.

These airports have a closely co-ordinated function as the principal gateways into the country for normal scheduled services, form a convenient unit for management and are, collectively, within sight of paying their way. Legislation for establishing an Authority will be introduced when details of its structure and functions have been fully worked out and when Parliamentary time is available.

Prestwick is included not only because it is a principal international airport, but because its inclusion will permit greater flexibility and economy in staffing and management arrangements.

The future development of the seven State-owned aerodromes serving large centres of population can, the Government believes, best be furthered under local ownership and management, with the support of local resources. Negotiations are already being carried on with Blackpool, and will be opened in the near future with the appropriate authorities about the future arrangements for the remaining aerodromes. These are: Bournemouth, Cardiff, Belfast, Glasgow, Edinburgh and Aberdeen.

Some aerodromes serving main centres of population meet a national as well as a local need. Where the cost of running these is an unduly heavy burden on local resources, it would be reasonable for the local authorities to expect the Government to give some assistance in recognition of the contribution made by the aerodromes towards national transport needs.

The Government is "exploring the possibility" of arranging for the nine aerodromes serving the remote parts of Scotland to be managed by an agent. There is no scope for transferring their ownership to local communities, but they form a homogeneous group for management. These aerodromes are: Inverness, Benbecula, Islay, Kirkwall, Machrihanish, Stornoway, Sumburgh, Tiree and Wick. The aerodromes serving the Isles of Scilly (St. Just and St. Mary's) are similar in some respects and the Government proposes to make arrangements for these also to be managed by an agent.

Technical Services:—The Government proposes to retain direct responsibility for providing en route technical services and also to accept responsibility for providing services for the approach, take-off and landing of aircraft at aerodromes where these services interact closely with en route requirements, or where other special circumstances require it. Technical services at the remaining aerodromes will be provided by the local aerodrome authorities. New arrangements will be made for payment for the use of technical services provided by the State.

The Government proposes to levy charges for the use of these services. The aim will be to increase the fees progressively until the cost is borne entirely by the civil aviation industry, but implementation of this will involve the continuation of Exchequer payments towards ground facilities for civil aviation for a period. The rate of progress towards financial self-sufficiency will need to be very carefully considered in the light of what the industry can bear at any particular time, but the Government considers it right that people travelling by air should pay an increasing part of the cost—and ultimately the whole cost—of the ground services.

In addition to the main features of the new policy, here are some interesting, if incidental, points made in the White Paper:—

The Maybury Committee of 1937 considered that an "appreciable measure of Government assistance" for radio and A.T.C. facilities was desirable for development, but that "such assistance should be given with the objective of eventually rendering civil aviation economically self-supporting."

The Government's policy has two fundamental aims—"to ensure the continued efficiency of the ground services and to make air transport self-supporting as soon as possible in order to secure the long-term prosperity of the industry."

"Some of the municipal airports, such as those at Manchester, Southend and Birmingham, handle more traffic than many of the State aerodromes."

"In the present financial year the revenues of Heathrow are expected to cover all the operating costs and also interest on capital and depreciation."

The Ministry "now operates only seven aerodromes serving large centres of population, whereas 25, including a number at which the traffic exceeds that at some of the seven, are operated by the municipalities."

"The local authority will need to show that the financial loss likely to be incurred in running an aerodrome of appropriate standards is greater than the local community can reasonably be expected to bear."

"It is expected that a small number of aerodromes, at present not supported by Exchequer grants, will apply for assistance for their development on the grounds that they meet the [necessary] criteria."

* "Civil Aerodromes and Air Navigational Services." Cmd. 1457; H.M.S.O., 9d.

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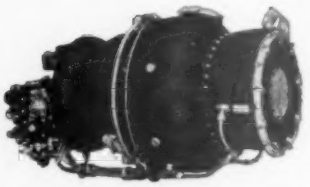
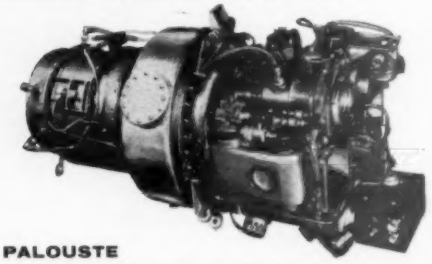
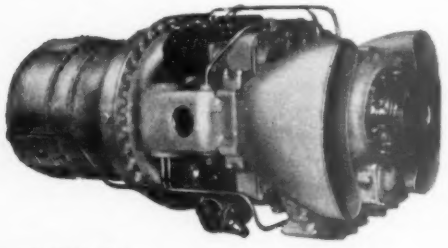


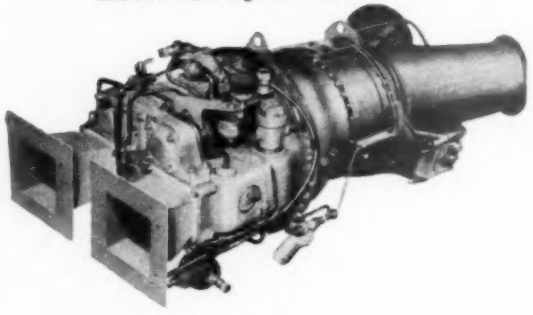
CUMULUS
The latest development in airborne units giving reduced size and weight and designed to meet all the most stringent air starting demands.



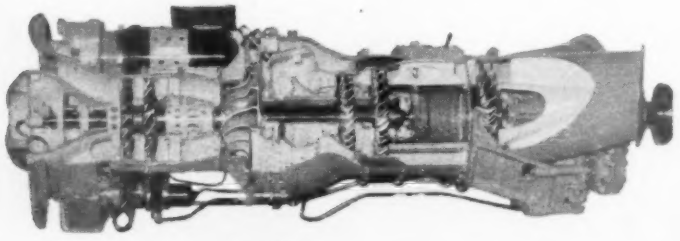
PALOUSTE
The standard low-pressure-air starter for the Royal Navy, Royal Air Force and aircraft manufacturers, etc.



ARTOUSTE
In quantity production as an A.A.P.P. for military and civil multi-engined aircraft.



TURMO
In production for helicopters, hovercraft and Royal Navy marine craft.

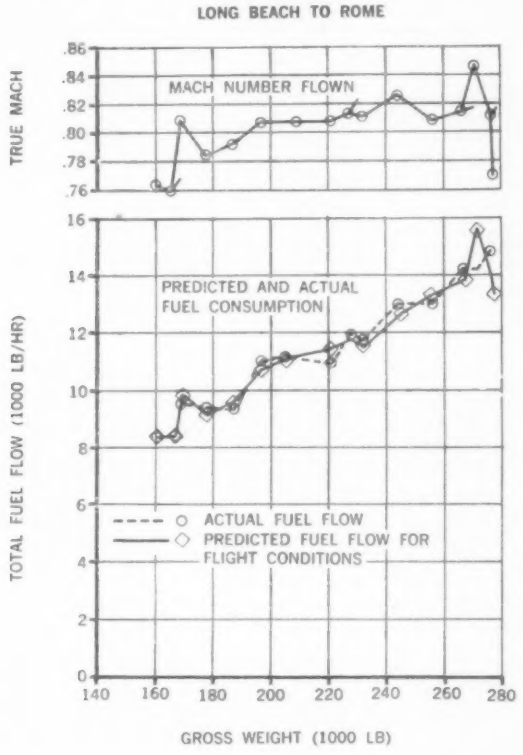


NIMBUS
A free-turbine engine in the 1,000-1,100 h.p. class specifically developed for helicopters and hovercraft.

Long-range Flights by the DC-8

IN the course of its functional and reliability testing to F.A.A. requirements for an airworthiness certificate, the turbofan-powered Douglas DC-8 Series 50 made one of the longest non-stop flights by a commercial jet aircraft. This was a flight distance of 5,991 naut. miles from Long Beach, California, to Rome, in 11 hr. 17 min. The return journey was made in three stages via Amsterdam and Caracas, for a total flight time for the round trip of 31 hr. 41 min.

Details of the flights given by Douglas are of interest in showing the very long-range potential of the Series 50 version, attributable primarily to the low specific fuel consumption of the Pratt & Whitney JT3D-1 turbofan engines. The aircraft used—the 146th DC-8—was one of five Series 50s scheduled for delivery to K.L.M. and did not have the 4% wing leading-edge extension recently adopted for the DC-8. It had a nine-tank fuel system (later aircraft have 10 tanks) and 1½° drooped flaps. With the new leading edge, Douglas estimates that the Long Beach-Rome flight would have required 7,000 lb. less fuel than was in fact consumed.



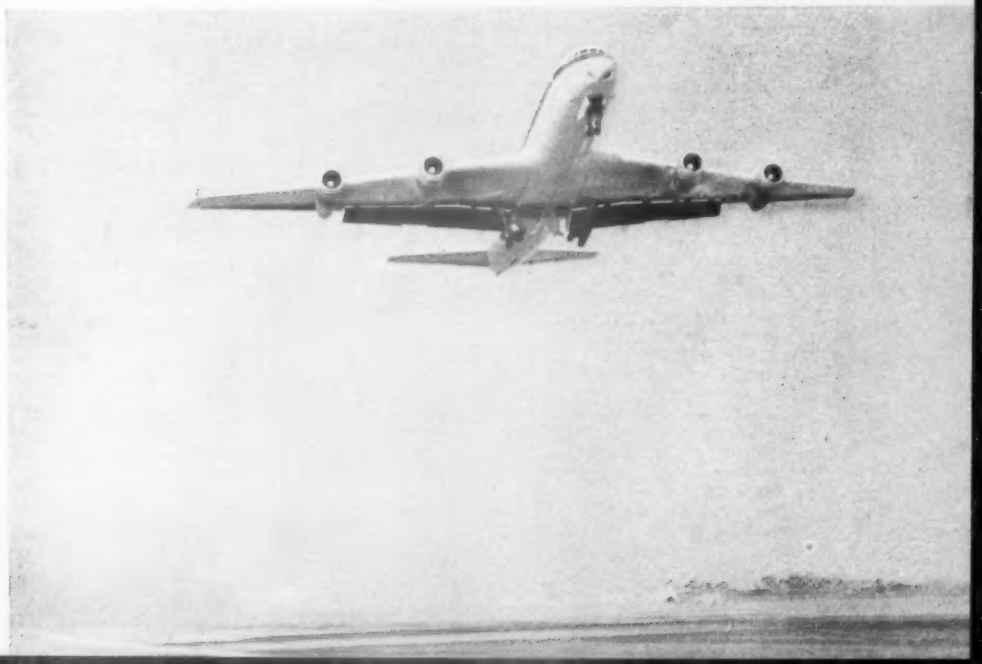
The four flights are summarized in the accompanying table. The take-off from Long Beach was made with full tanks and at a gross weight of approximately 5,000 lb. under the maximum permissible for runway length and temperature to comply with SR-422B. Maximum take-off weight of this model of the DC-8 is 315,000 lb., max. landing weight, 207,000 lb., and max. zero fuel weight, 176,500 lb.

After take-off the aircraft climbed to 27,000 ft. at 290 knots I.A.S., and thereafter at Mach 0.72 to the initial cruise altitude of 33,000 ft. The flight was pre-planned for zero wind conditions using Naples as the alternate with fuel for one hour's holding. An analysis of the prevailing weather showed that the best route would be south of the Great Circle, passing overhead Denver, Chicago, Montreal and Torbay (Newfoundland) and then following the 47th parallel to Bordeaux and going on via Marseilles to Rome. This gave an average tail-wind component of 56 knots.

Long-range cruise control was used en route, at pressure altitudes of 33,000 ft., 35,000 ft. and 37,000 ft. The cruise speed varied between Mach 0.845 and 0.76, with the majority of the flight made at Mach 0.81. Actual Mach numbers and fuel flow, plotted against aircraft weight, are shown in the two curves reproduced here.

FLIGHT SUMMARY

Origin .. .. .. Destination	Long Beach Rome	Rome Amsterdam	Amsterdam Caracas	Caracas Long Beach
Flight distance (n. m.)	5,991	755	4,605	3,324
Time: off to on (hr. min.)	11.17	2.04	10.35	7.45
Cruise altitude .. (ft.)	33,000 35,000 37,000	31,000	31,000 35,000 39,000	35,000
Average cruise speed (kt.)	470	480	460	470
Average wind component (kt.)	56 tail	100 head	25 head	43 head
Take-off weight .. (lb.)	291,000	225,550	280,000	252,450
Fuel on board .. (lb.)	152,600	89,350	145,500	109,789
Fuel burned .. (lb.)	133,418	28,350	122,700	90,607
Fuel remaining .. (lb.)	19,182	61,000	22,800	19,180



A Series 50 turbofan DC-8 is seen here on its initial climb-out from Long Beach Municipal Airport.

Air Transport . . . .

TEAL for New Zealand

ON Jly. 25 the agreement whereby New Zealand becomes the sole owner of Tasman Empire Airways was signed by the New Zealand Prime Minister and the Australian Minister of Civil Aviation.

The Australian Government will sell its half share in TEAL to the New Zealand Government for £A1,104,250 (£828,188). The sale will date from Apr. 1, 1961, but payment need not be completed before March, 1965. TEAL will have the right to fly to and through Sydney, Melbourne, Brisbane, and Norfolk Island. In return, New Zealand will allow Qantas, Australia's international airline, to fly to and through Auckland, Wellington and Christchurch. A commercial agreement safeguards TEAL's financial position.

In October Qantas as well as TEAL will be operating across the Tasman Sea. In due course, too, B.O.A.C. services may be flying over this route.

Three New Zealand appointments will now be made to the board of TEAL to fill the places of the three Australian members (Sir Hudson Fysh, Air Marshal Sir Richard Williams and Mr. W. C. Taylor) who will no longer be members of the board. Sir Leonard Isitt will continue as chairman.

SSR Operational Requirements

FOLLOWING the recent installation of Cossor secondary surveillance radar equipment at the Southern Air Traffic Control Centre at London (Heathrow) Airport and the introduction of a pilot scheme to employ SSR facilities with the centre's primary radar (see THE AEROPLANE AND ASTRONAUTICS for Jly. 6, p. 10), the M.o.A. has issued some further information of the operational aspects of the service.

In order to facilitate the initial trials stage of the pilot scheme, captains of civil aircraft equipped with SSR transponders flying in United Kingdom airspace are requested to switch their equipment to mode B/code "OO." Other codes will also be used from time to time, but in these cases S.A.T.C.C. radar controllers will inform aircraft of the one to be selected.

At U.K. combined military/civil radar stations, where the trials of the upper airspace radar service are in progress, captains may be requested to operate their transponders on mode A pending the full implementation of mode B SSR facilities at these units. Those transponders provided with a high/low sensitivity switch should be operated in the "high" position within the U.K. airspace.

The operational application of secondary radar will, in the first stage, be to the Upper Air Routes and in approximately 12 months time it will become mandatory for all civil aircraft operating at or above Flight Level 250 to carry an ICAO secondary radar transponder. The further development of air traffic services will involve the introduction of SSR facilities at each of the long-range radar stations now being planned to form part of an overall integrated civil/military A.T.C. organization.

It is also planned to lower progressively the flight level above which the carriage of airborne transponders will be mandatory.

B.E.A. in May

AS the table below shows, B.E.A. traffic in May was 19% above the level in the same month last year. This result was achieved in the face of considerable difficulties and at a time when the recession in American traffic to Europe was most felt. Despite the fact that this increase was well above the industry-wide average, however, the load factor fell by five points because the budgeted capacity was put up by 25%.

The results for June—not yet available in detail— also show an adverse discrepancy between capacity and traffic growth, although there are indications that the general recession in airline traffic on both sides of the Atlantic is now having less effect.

	May 1961	May 1960	Variation
Capacity ton miles offered ..	26,236,000	20,847,000	+25.9%
Load ton miles sold..	16,044,000	13,776,000	+16.5%
Revenue load factor..	61.2%	66.1%	− 7.4%
Passengers carried	407,783	345,508	+18.0%
Passenger miles flown	147,471,000	123,899,000	+19.0%
Passenger load factor	63.5%	66.6%	− 4.7%
Freight ton miles	1,534,200	1,481,700	+ 3.5%
Mail ton miles	322,700	334,800	− 3.6%
Aircraft miles flown..	3,894,800	3,652,600	+ 6.6%
Revenue hours flown	17,540	17,584	− 0.3%

By Coach or by Car?

IN a recent reply to a question in the House of Lords some informing figures were given about ratios between the different means of transport used by passengers in reaching London (Heathrow) Airport.

During 1960 a total of 2,618,057 passengers left Heathrow by air. Sampling (for what it is worth) showed that 1,374,000 (or 52%) came to the airport by airline coach; that about 864,000 (or 33%) came by private car; and the remaining 380,000 (or 15%) by other means—presumably by taxicab, hired car, or public transport.

So more than half the departing passengers were still—at least in 1960—using the town terminals and relaxing thereafter in the knowledge that they were "on their way" and that the service must wait for them.

Of the 949,631 spectators and sightseers who came to Heathrow in 1960 about 300,000 (or 32%) came to the airport by private car.

The Battle for the Domestic Routes

ON Monday, Jly. 31, the A.T.L.B. turned to the problem of the applications for rights on the British domestic routes. The hearings of European applications and objections had been completed on the previous Friday (see last week's issue, p. 122).

The first applications to be heard came from Cunard Eagle for services between London and Liverpool, the Isle of Man and Belfast. Giving evidence in support of the application, Liverpool's deputy town clerk said that the city had been starved of air services. He did not believe that the present schedules serving Liverpool were adequate for a city with a population of about three quarters of a million and in a "catchment area" involving about two million people. Approval had been given for the expenditure of £350,000 in improvements at Liverpool's Speke airport.

In its turn, Starways of Liverpool objected to all three applications because it had pioneered the London-Liverpool service since 1955, when B.E.A. had decided that it was unworkable. Considerable capital had been spent in building up the service and there was no justification for a second operator on the route.

On the second day of the hearings B.E.A. (which is objecting to Cunard Eagle's Isle of Man and Belfast applications) said that the accumulated loss on the Liverpool-Belfast service now stood at £1,242,000, and if a second operator came on the route the position might become so uneconomic that B.E.A. would have to abandon the Liverpool-Isle of Man sector of the service. The average number of passengers on the route was only 28.5 a day.

There was, according to B.E.A.'s representative, "tremendous unbalance" between the summer and winter; as an illustration he pointed out that 5,690 passengers were carried in August, 1960, and only 1,781 in January, 1961, between Liverpool and the Isle of Man. The low winter load was, however, a factor which had to be considered in the planning of scheduled services.

During 1960-61, the Liverpool-Belfast services—which included the Isle of Man sector—had suffered a loss of £17,000, which was the smallest loss so far.

The problem was that B.E.A.'s London-Belfast service was being used as a "commuter" service, with a substantial number of people using it out and back in a day. This tended to concentrate demand at the times of day which were popular with other people, such as holidaymakers.

On the third day Cunard Eagle's case was heard on its application for route rights from London to Edinburgh, Renfrew, Manchester and Birmingham. The four applications were being heard together. If these applications are granted, Cunard Eagle plans eventually to operate each service at a frequency of 14 flights weekly in each direction, although to start with a lesser frequency would be operated.

Cunard Eagle submitted that estimates of future traffic demand, both B.E.A.'s and Cunard Eagle's, supported the claim that another operator should be allowed on the routes. On the London-Manchester service there had been a very big increase in traffic carried. In 1960 B.E.A. carried 205,000 passengers over the route. Cunard's estimated increase involved 528,000 passengers by 1965-66 compared with B.E.A.'s expectation of 497,000.

B.E.A. estimated that if the applications were granted, traffic diversion, in terms of money, would result in substantial losses on all four routes—£263,538 on the Edinburgh service; £301,568 on the Glasgow route; £209,210 on the Manchester service; and £96,684 on the Birmingham service.

A Canadian Navaid for Europe

CONSIDERABLE interest is being shown in the U.K. and in other European countries in the application of high quality dead reckoning navigation systems for both military and civil use. A particularly successful example is the family of Position and Homing Indicator (PHI) systems developed and produced by Computing Devices of Canada, Ltd.

Latest in a succession of major installations for this lightweight precision air navigation system is in the Fiat G-91s of the German Air Force. A $6 million contract was recently awarded to the company for Type PHI-3B Position and Homing Indicators for these aircraft.

PHI-4 and PHI-5 navigation computers are already in production for the German Air Force F-104G and the R.C.A.F. CF-104 Super Starfighters, respectively. Other NATO countries using the G-91 and F-104 will, in all likelihood, carry a CDC navigation computer.

The PHI-4 dead reckoning navigation system in production for German Air Force F-104G Super Starfighters. The installation consists of three units : a remote computer, a position and homing indicator and pilot's control unit.

The original navigation computer was developed by Computing Devices of Canada under contract from the R.C.A.F. The instruments are being manufactured by the company in its plant at Ottawa, and by its licensees in Europe. These are Ottico Meccanica Italiana in Rome, Teldix in Heidelberg and Air Equipement in Paris. The German Government recently announced that an order for 1,000 PHI navaids had been awarded to Teldix.

In the German Air Force G-91 installation the PHI-3B navigation equipment is coupled with the Bendix Doppler radar; like all PHI equipment, however, it operates on airspeed and wind data as a standby mode. The system computes bearing and distance to any one of 12 destinations which are readily selected by a rotary switch. The entire destination package plugs into the equipment, so that a wide selection of targets, rendezvous, turning points and alternates is available.

The typical PHI installation comprises three units: a remote computer, the pilot's indicator, and a control panel. The pilot's indicator carries a rotating compass card which shows aircraft heading at 12 o'clock; a moving pointer shows the bearing to destination against the card. As a result, flying the aircraft to bring the pointer to 12 o'clock makes the aircraft head toward the destination; the indicator also displays miles-to-go. It is customary to install the PHI indicator in place of the compass indicator as all compass functions are duplicated, so that panel space is saved.

About 5 in. square, the PHI control panel, in the F-104, is mounted beside the pilot. Its controls permit the selection of a destination and the setting of wind speed and direction. In Doppler versions of PHI it is customary for the instrument to carry out a running calculation of wind using air velocity and ground velocity as the basic data. In the event of a Doppler drop-out, the PHI switches itself over to the use of airspeed plus wind for navigation purposes. In this way no loss in information regarding distance gone can occur.

In the inertial platform versions, a dual computer is provided. One calculates position from air data and wind and the other from inertial information. This arrangement permits a quick cross check of the two data sources at any time. Any features which could cause errors to be built up slowly over a period of time can thus be easily checked.

The computer design is basically electro-mechanical. PHI does contain a small number of transistors as amplifiers in the servo loops but the main computing elements are mechanical. It is interesting to note that some of the devices used were originally developed in the United Kingdom for the Royal Navy.

Computing Devices of Canada also developed the ANTAC (Airborne Navigation and Tactical Control) system for anti-submarine warfare rôles. The ANTAC system has been installed in the R.C.A.F.'s CL-28 Argus aircraft and will soon be installed in their Neptunes. Components of the system are currently being evaluated by European airframe companies for similar maritime-reconnaissance duties.

One example of the technical interchange between Great Britain and Canada on the Position and Homing Indicator is the VICOM photo-reconnaissance system. This equipment, developed jointly by W. Vinten, Ltd. (London) and Computing Devices of Canada, records the outputs of PHI in the form of position co-ordinates on each frame of the 70-mm. ciné film, so that the position from which the photograph was taken is permanently recorded. Several Air Forces are studying possible applications to reconnaissance versions of fighter aircraft.

Among the interesting off-shoots of the PHI system are devices for the computation of fuel remaining at destination, a tactical topographic display and computer controlled climb/descent programmes.

For aircraft requiring long-range navigation capability a spherical navigation version of PHI known as GLANCE (Global Lightweight Air Navigation Computing Equipment) has also been developed by the Canadian company. This instrument retains the features of selection of a variety of destinations using a switch and plug-in package as well as display of great circle course and miles-to-go. The 30-lb. system also computes and displays aircraft position in latitude and longitude up to 89° 30' north or south. This unusually wide range of latitude is achieved by the use of an arrangement of the equations of spherical navigation.

The cockpit of a NATO G-91 showing the PHI-3B navigation indicator mounted in the centre of the instrument panel. The wind unit for the system can be seen slightly below on the left.

The Fighting Services

Standard for No. 120 Squadron

AS part of the Royal Scottish tour, H.M. the Queen and H.R.H. the Duke of Edinburgh will visit R.A.F. Kinloss on Monday, Aug. 14. They will spend 45 minutes at the Coastal Command station, where Her Majesty will present a Standard to No. 120 Squadron (Wg. Cdr. H. M. Carson).

At present operating Shackleton Mk.3s., No. 120 Squadron claims to be the Command's champion U-boat hunters of World War II, with a score of 16 U-boats sunk, half-share in three others and eight damaged. No. 120 took an active part in "bridging the gap" over the North Atlantic, to give allied convoys complete protection from the air.

R.A.F. Kinloss (Gp. Capt. P. M. Stembridge) was opened in 1938 as a flying training school. In 1939 it was transferred to Bomber Command and became the base of No. 190 Training Unit. Coastal Command took over the station in 1947 and No. 120 Squadron moved in from R.A.F. Aldergrove in April, 1959.

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AIR VICE-MARSHAL E. M. F. GRUNDY, C.B., O.B.E., has become Commandant-General of the R.A.F. Regiment in succession to Air Vice-Marshal J. H. Harris, C.B., C.B.E., who is retiring from the Service.

Commissioned from the R.A.F. College, Cranwell, in 1928, Air Vice-Marshal Grundy flew with No. 56 Squadron, and with the Fleet Air Arm in Britain and China. During the 1939-45 War he commanded No. 80 Wing, and served in the Mediterranean and Middle East theatre. Since 1945 he has been Deputy Chief Signals Officer at SHAPE; Senior Air Staff Officer, British Joint Services Mission in Washington; and chairman of the N.A.T.O. Military Agency for Standardization in London. Prior to his new appointment, Air Vice-Marshal Grundy was Air Officer in charge of Administration, F.E.A.F.

Air Commodore F. M. Milligan, at present in Washington as Principal Assistant Air Attaché, is to become Commandant of the Central Reconnaissance Establishment at Brampton in September.

Bomber Command Presentation

THE senior R.A.A.F. representative on the staff of the High Commissioner for Australia, Air Vice-Marshal A. M. Murdoch, visited R.A.F. Marham recently to present No. 207 Squadron with the Bomber Command Efficiency Trophy. Equipped with Valiants since 1956, the Squadron is commanded by Wg. Cdr. W. E. Martin, D.F.C., A.F.C.

Runner-up for this annual award to the Command's V-bomber squadron which has achieved the best all-round performance in all aspects of operation and training is No. 617 Squadron (Wg. Cdr. L. G. A. Bastard, A.F.C.) based at R.A.F. Scampton.

V.I.P. CREW.—Seen by their aircraft are the crew of the R.A.A.F. Metropolitan which will be used by the new Governor-General of Australia, Lord de L'Isle and Dudley, V.C. Left to right, L.A.C. W. J. Bankes, steward; Flt. Lt. J. T. Carter, captain; Flg. Off. I. D. Bridge, co-pilot; Flt. Lt. N. Reidy, navigator; and Cpl. R. W. Downie, fitter.

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During its long history No. 6 F.T.S. has trained many famous people, including Wg. Cdr. Guy Gibson, V.C., and Wg. Cdr. J. Fleetwood, D.S.O., who located the prison ship "Altmark" at the beginning of the War. It is at present commanded by Gp. Capt. F. W. M. Jensen, O.B.E., D.F.C., A.F.C., and the Chief Instructor is Wg. Cdr. D. N. Fearon.

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Technical Training Command: Wg. Cdr. M. J. Underhill, to No. 2 Radio School, R.A.F. Yatesbury, as Senior Training Officer.

Near East Air Force (Cyprus): Wg. Cdr. M. G. Fountain, to Headquarters for technical staff duties; Gp. Capt. K. G. Hubbard, O.B.E., D.F.C., A.F.C., to R.A.F. El Adem, to command.

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Other Appointments: Wg. Cdr. D. K. Warburton, A.F.C., to the Ministry of Aviation; Wg. Cdr. J. C. Button, D.S.O., D.F.C., to The Hague as Air Attaché, with the acting rank of Gp. Capt.; Sqn. Ldr. P. B. Dignan, to Djakarta as Air Attaché, with the acting rank of Wg. Cdr.; Wg. Cdr. G. J. N. Neal, to the U.S.A.F. Base, Wright Patterson Field, on exchange posting.

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A type by type examination of the latest Russian military aircraft, based on available information and photographs taken during last month's display at Tushino

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Broadly speaking, each of the 10 or so major design groups is responsible for a particular category of aircraft, as follows:—

Antonov:	Civil and military transports; gliders.
Beriev:	Flying boats and naval aircraft.
Ilyushin:	Civil transports. Present military activities not known.
Kamov:	Helicopters.
Mikoyan:	Fighters.
Mil:	Helicopters.
Myasishchev:	Bombers.
Sukhoi:	Fighters.
Tupolev:	Civil transports; bombers.
Yakovlev:	Fighters and light bombers; trainers.

Yakovlev. One of the outstanding revelations at Tushino was the appearance of two examples of the possibly Yakovlev supersonic tactical fighter-bomber code-named Blinder. Many details can be seen in the photograph of Blinder which forms the heading of this article (picture 1)—lateral air intakes with half-cone shock bodies for the two engines, which lie side-by-side in the fuselage and have separate tailpipes with afterburners; nose radome; cockpit with tandem seating for two crew; trailing-edge fairings which probably house the main undercarriage units, but may also serve as drag-reducing anti-shock bodies; a large ventral fairing which is either a fuel tank or a radome; two ventral fins and an air-to-air missile beneath each wing. Air-to-ground missiles obviously could be carried.

This aircraft type was first identified in Russia in 1959, according to U.S. reports (which may be referring to photographs obtained by U-2s). It seems to be related to one of the aircraft shown to Western observers in 1956 and then code-named Backfin, and may simply be the production development of what was then a prototype.

Other Yakovlev fighters seen in the show were variants of the

2.—A development of Flashlight C, a light tactical bomber variant of the original Flashlight, or Yak-25. With its big afterburners, intake shock cones and extended wings, this variant is almost certainly level supersonic.

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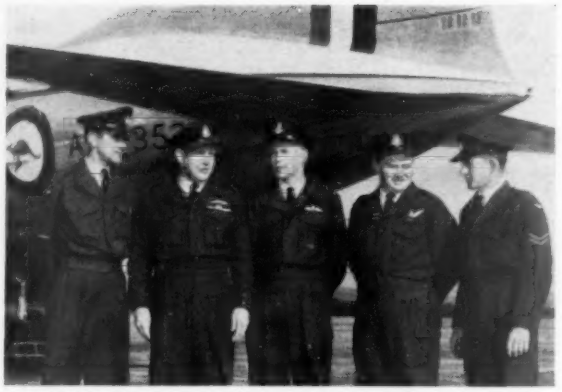

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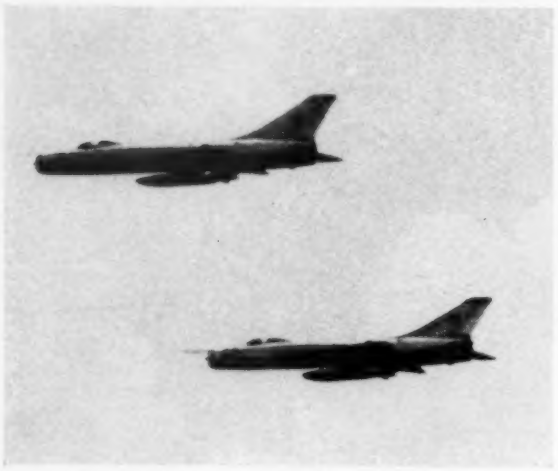
Tupolev:	Civil transports; bombers.
Yakovlev:	Fighters and light bombers; trainers.

Yakovlev. One of the outstanding revelations at Tushino was the appearance of two examples of the possibly Yakovlev supersonic tactical fighter-bomber code-named Blinder. Many details can be seen in the photograph of Blinder which forms the heading of this article (picture 1)—lateral air intakes with half-cone shock bodies for the two engines, which lie side-by-side in the fuselage and have separate tailpipes with afterburners; nose radome; cockpit with tandem seating for two crew; trailing-edge fairings which probably house the main undercarriage units, but may also serve as drag-reducing anti-shock bodies; a large ventral fairing which is either a fuel tank or a radome; two ventral fins and an air-to-air missile beneath each wing. Air-to-ground missiles obviously could be carried.

This aircraft type was first identified in Russia in 1959, according to U.S. reports (which may be referring to photographs obtained by U-2s). It seems to be related to one of the aircraft shown to Western observers in 1956 and then code-named Backfin, and may simply be the production development of what was then a prototype.

Other Yakovlev fighters seen in the show were variants of the

2.—A development of Flashlight C, a light tactical bomber variant of the original Flashlight, or Yak-25. With its big afterburners, intake shock cones and extended wings, this variant is almost certainly level supersonic.

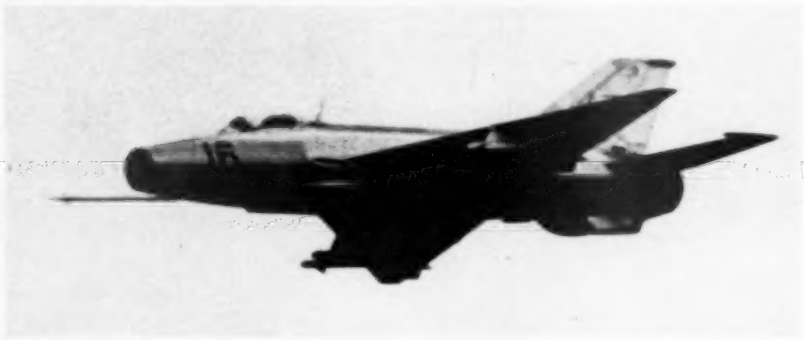


3.—Sukhoi Fishpot deltas—two of a formation of three photographed at Tushino.

now elderly Yak-25 Flashlight, the first Russian twin-jet all-weather fighter in service. Two variants were seen, and these also can be related to the aircraft exhibited on the ground in 1956 and since identified as Flashlight B and Flashlight C.

Flashlight B, in its 1961 version, is an all-weather interceptor, with a nose radome and an air-to-air missile beneath each wing. The engines now have afterburners, and the wing between the fuselage and engine nacelles has greatly increased chord (and therefore a lower t/c ratio) achieved by sweeping forward the leading edge. This aircraft is now probably just supersonic, and the introduction of a saw-tooth leading edge indicates a pitch-up problem encountered and overcome.

Most of the improvements incorporated in this Flashlight B were also exhibited on Flashlight C, a light tactical bomber version with a glazed nose and a ventral radome (see picture 2).



5.—Left, the Mikoyan delta-winged day fighter code-named Fishbed and carrying Sidewinder-type missiles.

Sukhoi. Among the formation of Soviet Air Force fighters which appeared over Tushino was one group of a swept-wing type and one of a delta-wing type which, on close examination, appear to be identical apart from the wing. These two types can be regarded as the NATO-designated Fitter and Fishpot, prototypes of which appeared in 1956. Products of the Sukhoi design bureau, they are respectively contemporaries of the Mikoyan Faceplate (MiG-21) and Fishbed.

The Fitters appeared with a store under the fuselage which was probably a long-range tank, and with a smoke canister (for formation aerobatic display) on each of the two wing pylons. The Fishpot (picture 3) also carried what appeared to be a ventral fuel tank, on a pylon, and four air-to-air missiles under the wings; they are the only Soviet fighters seen so far with four missiles.

Two other aeroplanes which made a brief appearance have also been tentatively credited to Sukhoi. Each is a large, single-engined delta, with a nose intake and a conical shock body (presumably serving as a radome) similar to that of the Mikoyan (?) twin jet illustrated (picture 4). Small differences distinguished the two types. One carried two air-to-air missiles of the type seen on Flashlight B; the other had two of the smaller AAMs which seem to be standard on the present generation of Soviet day fighters.

Mikoyan. The doyen of Russian fighter designers, Mikoyan is believed to be responsible for the highly interesting long-range all-weather interceptor illustrated (picture 4). It is a twin-engined aeroplane, judging by the twin jet pipes, and has an annular intake round the nose radome. The length of the nose is impressive and seems to provide considerable space for fuel stowage. There is evidence of a rocket boost engine in the fuselage between the jet pipes, and two ventral fins are fitted. The air-to-air missiles are of a type not seen on other Soviet aircraft.

Several examples of the Mikoyan delta-winged day fighter known to NATO as Fishbed appeared, with small differences apparent in some cases. Picture 5 shows what is presumed to be the standard model, with an AAM under each wing and a third beneath the fuselage. Unlike the Sukhoi Fishpot, Fishbed has a ventral fin.

4.—Above, the twin-jet long-range all-weather delta interceptor, seen for the first time and believed to be a Mikoyan design.

A short-field version of Fishbed was seen, with a jettisonable rocket under the fuselage and a tail parachute, and another demonstrated the use of a rocket booster for climb performance. Fishbed is apparently closely related to the swept-wing MiG-21 Faceplate, prototypes of which appeared in 1956 and which was in service by 1959. Thus it appears that Mikoyan and Sukhoi each developed, almost concurrently, a supersonic swept-wing fighter and an alternative of the same design with a delta wing. All four types seem to have reached operational status.

Myasishchev. This designer's work was represented by the mighty Bounder delta-wing bomber (picture 6). This was first reported in 1958, but is not yet in service so far as is known. Its purpose apparently would be to replace the Myasishchev Bison four-jet bomber which has been standard equipment for a number of years. Significantly, perhaps, Bison did not appear in the display.

Although the size of the Bounder delta wing appears to be

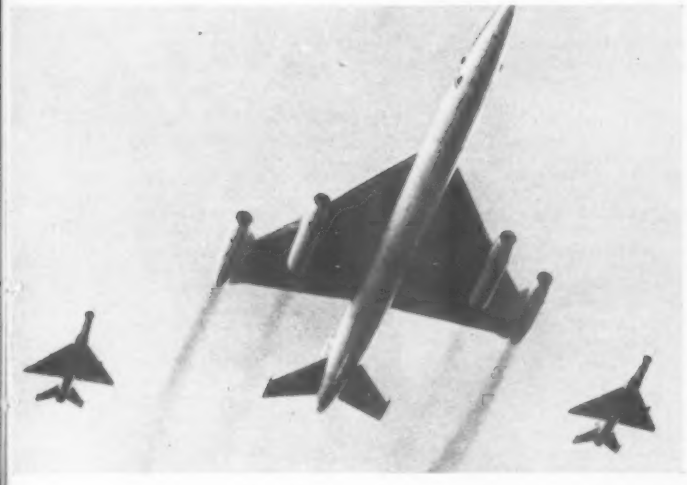
about the same as that of the Vulcan (span approx. 100 ft.) the fuselage must be nearly 200 ft. long; the aeroplane thus qualifies as the World's largest delta, with a gross weight probably well above 300,000 lb. The inner engines have afterburners. The undercarriage, like that of Bison, is probably of the bicycle type with outriggers. Other details can be seen in the picture.

Tupolev. Since Myasishchev was probably responsible for Bounder, it seems reasonable to assume that the other new supersonic bomber, called Beauty, is the product of the other principal bomber design bureau—that of Tupolev. The alternative would be Ilyushin, but this designer was not mentioned in the list of those whose work was represented in the fly-past of military aircraft.

Beauty was illustrated in our issue for Jly. 20 and 10 examples were shown over Tushino, of which one carried a stand-off bomb, or ASM, under the fuselage. The most remarkable feature of this aircraft is its rear-mounted engines, on each side of the fin above the fuselage proper. This leaves the thin wing free of encumbrances other than the undercarriage stowage/anti-shock bodies at the trailing edge. The tailplane, probably a slab type, is low on the fuselage for maximum control of pitch-up, and the wings have a prominent boundary layer fence outboard of the fairings.

The single Beauty carrying a missile also had what appeared to be a retractable flight-refuelling probe in the nose, which is elegantly pointed in keeping with the whole design.

Two other Tupolev bombers appeared with stand-off bombs—the Tu-16 (Badger—see our issue for Jly. 20) and Tu-20 (Bear). The former carried a missile which has been likened to the North American Hound Dog, carried by the B-52G, and a large nose radome has been substituted for the former glazed visual aiming and navigation station. The Tu-16 is, of course, the military forerunner of the Tu-104 jet liner.



6.—Above, the Bounder—a delta-winged bomber believed to be from the Myasishchev bureau—escorted by two Fishbeds.

The Tu-20 Bear turboprop bombers (picture 7) were seen carrying missiles with swept-back wings and tail, believed to be jet powered and supersonic. These aircraft also have large nose radomes for the missile-launching rôle.

8.—One of the four swept-wing turbojet Beriev flying boats flown at Tushino. These appear to bear little relationship to the straight-winged jet flying-boat previously indentified as the Be-8.

Beriev. One of the least known of Russian designers, Beriev has for long been concerned with flying boat development and his jet boats seen at Tushino (picture 8) are probably the fastest in the World since the Martin SeaMaster was abandoned. The picture reveals the swept wing—with two fences on each side—retractable wing-tip floats, nose radome, tail turret, jet nacelles in the wing/fuselage "armpit" and the unusual bow shape. The prominent "strake" round the bow no doubt acts as a spray-guard to protect the engines from sea-water ingestion. Stores must be carried in the hull or externally.

Kamov. A new helicopter from this design bureau was glimpsed briefly over Tushino. Apparently developed from the co-axial Ka 18, it is larger and is reported to be turbine powered. A large radome in the nose, and an air-to-surface missile carried externally on each side of the fuselage indicated an anti-submarine rôle.

Kamov was also responsible for the Vintokryl (code-name Hoop) convertiplane illustrated in our Jly. 27 issue.

(*Continued on page 156*)

7.—Right, the familiar four-turboprop Tu-20 Bear was carrying a stand-off bomb which can be seen in this photograph. A new radome installation is also visible in the nose.

(*Continued from page 155*)

Mil. The other principal rotorcraft designer, Mil, was responsible for the massive crane helicopter illustrated in our Jly. 13 issue. This is a close relative of the Mi-6, which, since its appearance towards the end of 1957, has been the World's largest helicopter. The crane version seems to have an identical power system (two Soloviev turboshafts) and rotors, but has a new slender fuselage—capable of seating about 50 passengers—and a stalky undercarriage allowing large loads (missiles, for instance) to be slung externally. The single example shown was in Soviet Air Force markings. It does not have the wing which has been introduced on the Mi-6 since it first appeared.

At least nine examples of the Mi-6 itself appeared. Six of these landed, and disgorged two tactical missiles and their associated transport and support equipment. The other three Mi-6s flew past, one carrying the Vostock space capsule (picture 9) and another carrying a model of the Lunik probe.

Some Conclusions

These occasional Russian air orgies are interesting intelligence exercises which inevitably leave most questions without a positive answer. What has happened, for example, to some of the prototypes of which Western observers were given tantalizing glimpses at Kubinka during the last raising of the military aviation curtain in June, 1956? Where are Brawny and Boot, a twin-jet straight-wing ground attack monoplane and a single turboprop naval torpedo type, respectively, and why was the competent-looking twin-turbojet Blowlamp (another Kubinka demonstrator) not represented at the most recent Tushino display?

To what aircraft, going a stage further, do the many odd designations used in Russian record claims apply? Which of the many newcomers were the 103-M, the T-405, or the E-66, to mention a few of these clearly spurious numbers? If they were designed to mislead, they must be presumed to have been very successful—although possibly less confusing than the battery of NATO code-names applied with such abandon.

Is Blinder, for example, anything more than a definitive version of the 1956 Backfin? In that case would it not be better off as a Backfin B, or something similar, to show the relationship? And where the designation becomes known, as in the case of Tu-16 for Badger, and Tu-20 for Bear, why not drop the fifth-form appellation?

Confusion of Designations

For the record, the current list of Russian submissions to the F.A.I. is worth examining for possible relationship to the aircraft recently displayed. In the heavyweight class, two designations were given for an aircraft which set up a number of records with varying payloads over long ranges and to altitude. The 103-M was described in October, 1959, as a mid-wing monoplane powered by four 28,660-lb. Type D-15 turbojets, and carrying payloads between 1,000 and 27,000 kg. (2,200-59,525 lb.) over 1,000 km. (621 miles).

Clearly a very big aeroplane, with a maximum gross weight of at least 300,000 lb., and probably 350,000 lb. To achieve a mean speed of 638.75 m.p.h. over the 1,000 km. presupposes a very high subsonic cruise, but also indicates the probable lack of sustained supersonic capability. This really leaves only the Myasishchev Bison, which did not appear at the recent Tushino show, in the running, since the equally enormous Bounder, also probably a Myasishchev design, ought to have been able to sprint round above M=1.

For the load-to-height records, in September, 1959, at which the fantastic payload of 121,480 lb. was lifted to 2,000 m. (6,560 ft.) and only a few pounds less (55,000 kg.) to 43,048 ft., as well as 10,000 kg. (22,000 lb.) to 50,253 ft., the mid-wing 201-M was used, powered by similar engines. With a crew of at least five, it was quite possibly the same aeroplane as the 103-M, although why it should have been given a different designation is not clear.

On Oct. 31, 1959, Col. Mossolov set up a brief absolute speed record of 1,484 m.p.h. over a 15-25 km. course in an E-66 delta-wing monoplane, powered by a 13,117-lb. s.t. type TRD Mk. RS7F turbojet. On Apr. 28, this year, the same pilot established a new World altitude record, also in an "E-66 delta," of 111,880 ft.

This aeroplane was almost certainly either the Sukhoi Fishpot or the Mikoyan Fishbed, with no real evidence to point one way or the other. Either type could also have corresponded to the T-405, which set up a 100-km. closed-circuit record of 1,299.24 m.p.h. in May, 1960, with an unspecified engine, or the height-record T-431 earlier flown by Vladimir Ilyushin to 94,657 ft. with a 19,840-lb. s.t. turbojet.

The remaining unknown is the so-called RV, in which V. Smirnov set up two payload-to-height records in July, 1959. Described as a swept mid-wing monoplane with two 8,818-lb. Type 37V turbojets, the RV lifted 1,000 kg. to 67,113 ft. and 2,000 kg. to 66,188 ft. To carry a 4,409-lb. payload to that sort of height requires a moderately large fighter or small bomber, so that RV might be one of the Flashlight series or even one of the newer types. As for the Beriev jet flying-boats at Tushino, these do not correspond with the anticipated Be-8 because of their swept wings, so that their actual designations are also unknown.

9.—The Mi-6 carrying the Vostok space capsule, or what purports to be the Vostok.

Not a very rewarding exercise, perhaps, but then speculation on Russian technical progress seldom is. What is fairly apparent is that there were no fewer than eight airborne missile types shown for the first time at Tushino—if fleeting glimpses, and sometimes not-very-clear photographs under aircraft which are dashing past the cameramen, can be described as constituting a "show."

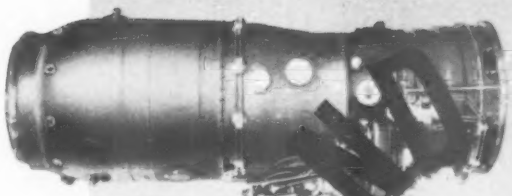
The range of weapons carried makes it possible to understand how Powers' U-2 could have been intercepted, despite its extreme height. The liquid rocket-boosted Fishbed which flew past at Tushino may well have resulted from the high-altitude interception requirement, since the U-2 was almost certainly not the first U.S.A.F. type to overfly the Soviet Union on reconnaissance missions. The development of airborne guided weapons in Russia, however, seems to have been comparatively recent.

Three of the guided weapons were of the long-range air-to-surface type, all of aircraft configuration, with wings and air-breathing engines. Suited, in fact, for horizontal rather than ballistic trajectories, and of relatively slow performance. The fourth ASM was of the short-range variety, carried in pairs by the Kamov anti-submarine turbine helicopters.

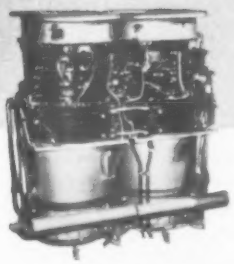
Of the four air-to-air missiles shown, two bore a remarkably close relationship to the infra-red homing Sidewinder and the radar-guided Sperry Sparrow. That the similarity in appearance between the American and Russian missiles is probably accompanied by corresponding functions is indicated by the fact that the Soviet "Sidewinders" were carried by day fighters (Mikoyan Fishbed and Sukhoi Fishpot) without radar, whereas the weapons resembling the Sparrow were on underwing racks of the AI-equipped Mikoyan twin-jet "destroyer" delta. Another radar-guided type was carried by the Flashlight or Yak-25 development.

Largest of the AAM ASMs was the delta-winged weapon beneath the shapely wings of Blinder, which, although given a B-for-Bomber code-name, could easily be a heavy fighter or ground-attack aircraft. It is quite possible that the missiles on this type could also be dual purpose and, from their size, they could almost certainly carry a nuclear warhead.

And on that note of unpleasant speculation we will have to leave the depressing impact of the 1961 Tushino show—in the way in which Sir Winston Churchill once summed up some other aspects of the Russian scene: "a riddle wrapped in a mystery inside an enigma."



POWER FOR LIFT AND PROPULSION



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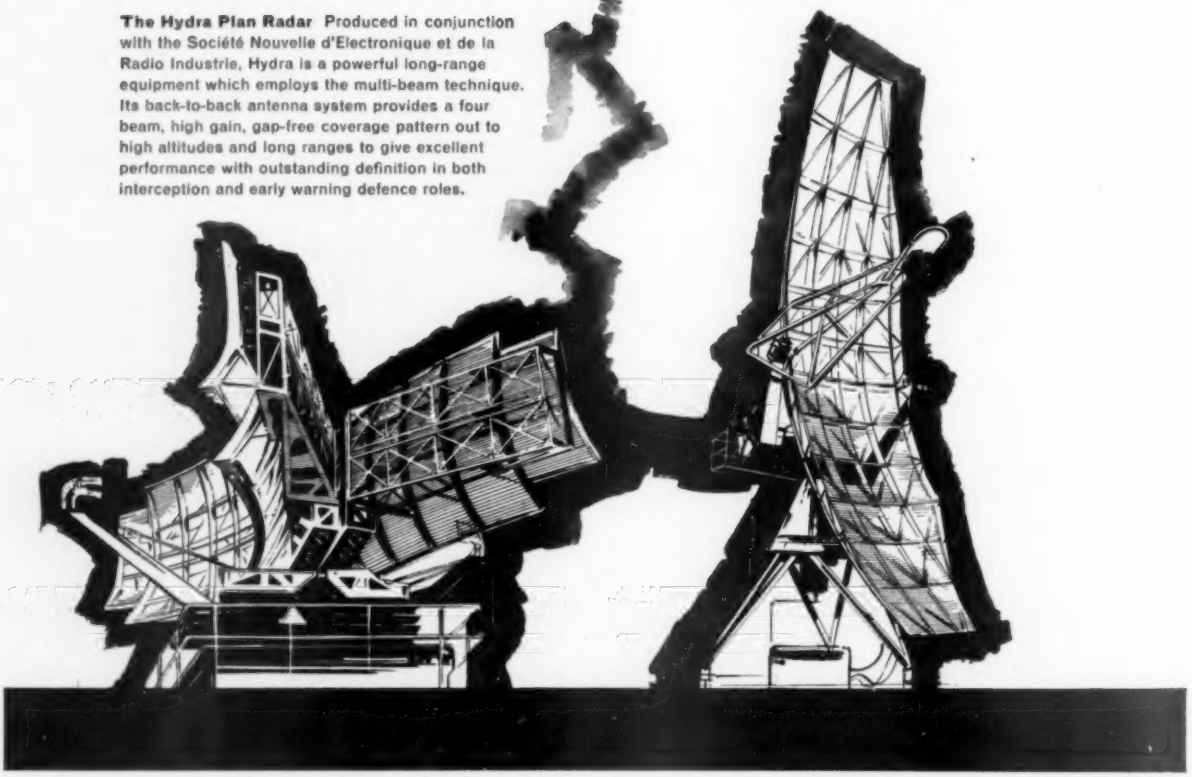

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Von Pirquet and Russia's Venus Probe

AN interesting sidelight on the launching of the Russian Venus probe earlier this year is a comment just received from Ing. Guido von Pirquet, the Austrian astronautical pioneer, to the effect that the orbit chosen for this mission was exactly the one described by himself in the journal *Die Rakete* in May, 1928. This would not be so remarkable if the orbit in question had been the classical one of "minimum energy," the duration of which is set by the laws of celestial mechanics at 146 days (Fig. 1). In the case of the probe launched on Feb. 12, the Russians chose a transfer orbit which intercepted the target planet much earlier and, because of this, the path of the probe actually cut the orbit of Venus (Fig. 2) instead of merely grazing it.

In an official statement published in *Pravda* on Feb. 26, the reasons for this were clearly stated: "Suitable intervals between launching dates [for Venus probes] range from one to two months, and are periodically repeated after approximately 19 months. One of these intervals fell at the end of 1960 and the beginning of 1961. This was utilized in the launching of Feb. 12.

"After escape, the station enters an elliptical orbit of periodical motion round the Sun. In connection with this, the length of flight to Venus may vary greatly in different advantageous trajectories. There are trajectories by which the automatic interplanetary station will meet Venus in the first half of its revolution round the Sun, in the second half of the revolution, and so on.

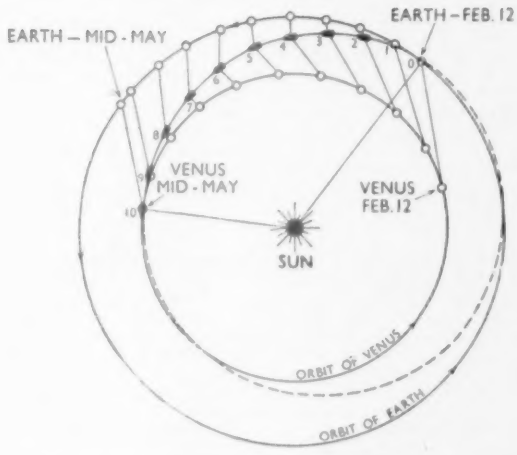


Fig. 2. Orbit of the Russian Venus probe as published in *Pravda* on Feb. 26, 1961.

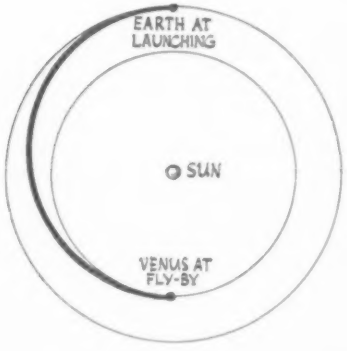


Fig. 1. The minimum-energy Hohmann transfer orbit for Venus is a semi-ellipse touching the planetary orbits as shown; the journey time is 146 days.

"For the launching of Feb. 12, a trajectory was selected ensuring that the station would meet Venus in the first half of the revolution. As compared with this, trajectories of other types have certain drawbacks, entailing an increase in the time of flight and a substantially greater possibility of the station's deviation from Venus as a result of mistakes at the end of the boosting phase. Moreover, the distance from the Earth to Venus at the moment of the station's approach to the planet, if these trajectories were chosen, would, as a rule, be much greater than in the present case."

1928 Orbit

Ing. von Pirquet explains that in his original diagram, published in 1928, he deliberately cut off the orbit of revolution by 30° at each end, so that he got for the whole orbit an included angle of 120° instead of 180° (Fig. 3). He also subdivided the orbit into 10 equal intervals of time, indicating the arrival within the last interval—at 97 days.

Now, turning to the *Pravda* diagram, it can be seen that precisely the same orbit and method of sub-division have been used. The last interval, considerably smaller than the one preceding it, corresponds to an interval of seven days—actually the period of May 13 to 20. The remainder are of 10-day equal intervals, the whole amounting to a flight time of 97 days.

The question might thus be asked: Did the Russians deliberately choose von Pirquet's 1928 orbit for their 1961 Venus mission, or was it purely a coincidence arrived at from similar deep theoretical considerations? Either way, it is extremely flattering to the 81-year-old astronautical pioneer.—K.W.G.

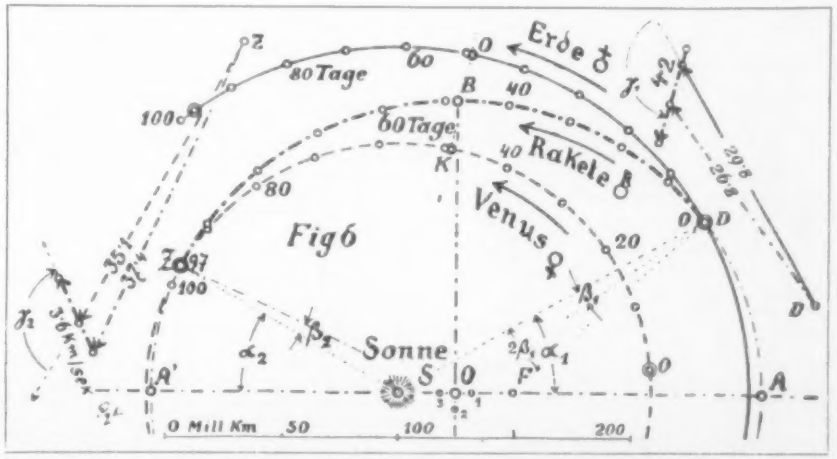


Fig. 3. The transfer orbit to Venus proposed by Ing. Guido von Pirquet in 1928.

Orbital Disruption of Able Star

AN explosion has scattered fragments of the Able Star rocket responsible for orbiting the navigation satellite Transit IV-A and the two "pick-a-back" satellites Injun and Greb III on Jne. 29. The last two, which should have sprung apart, have remained locked together (THE AEROPLANE AND ASTRONAUTICS, Jly. 6, 1961, p. 2).

The orbits achieved were originally given by NASA as: Transit IV-A, perigee 534 miles, apogee 623 miles; and Injun and Greb, perigee 534 miles, apogee 634 miles. The respective orbital periods were 103.7 and 103.8 min.

The Able Star carrier rocket was moving in a similar orbit to the satellites, but in place of the expected three objects (1961 Omicron 1, 2 and 3) predictions have been received from Spacetrack for numbers up to Omicron *42*. The periods of this large number of "trackable" objects range from 100 to 107 minutes.

What caused the rocket to explode is difficult to ascertain with certainty, but it appears possible that a short-circuit may have led to the detonation of the "destruct" system; it seems unlikely that, in this day and age, a stray signal could have set it off accidentally. Alternatively, the restartable engine (which employs self-igniting propellents) might have exploded, or there may have been a tank explosion.

Total mass in orbit, including the three satellites, the upper stage Able Star and accessories, has been given as 1,622 lb. The scattering of this cloud of debris in long-life orbits not only represents an unwanted complication for the U.S. Space-warn network but may introduce a hazard for future space vehicles. American space-trackers have already coined a name for the fragments. They call them the "Omicron Belt."

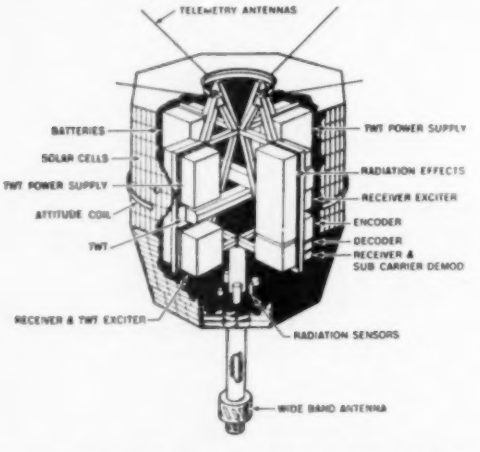
Co-operation in Project Relay

SATELLITE communications across the North Atlantic are expected to be opened up experimentally next year when the Relay satellite is launched from Cape Canaveral. The G.P.O. is to co-operate in these experiments using a special tracking station on Goonhilly Downs at Lizard Point, Cornwall.

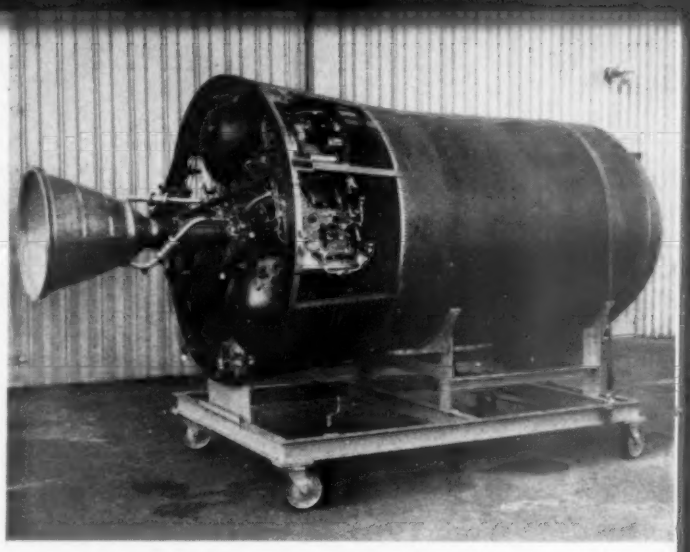
Early details of this project, which is now in the hands of the Radio Corporation of America under a NASA contract worth more than $3 million, were given in THE AEROPLANE AND ASTRONAUTICS on Feb. 3, 1961, p. 123.

Relay is the first active repeater satellite in NASA's research and development programme to determine the feasibility and technology of satellite communications systems. Under agreements approved by the respective countries, communications agencies in Great Britain and France will participate in the experiments and are constructing ground stations. Other countries are also expected to contribute, including West Germany.

So far as ground stations in the United States are concerned, NASA is contracting with the American Telephone and Telegraph Company and with the International Telephone and Telegraph Company for the use of the A.T. and T. station at Rumford, Maine, and the I.T. and T. station at Nutley, New Jersey. The Space Technology Laboratories, of Los Angeles, Calif., will assist in project co-ordination and systems planning.



First drawing to show the configuration of the Relay active communication satellite which is being built for NASA by the Radio Corporation of America. Measuring 29 in. high and 26 in. diameter, less aerials, it will weigh about 100 lb.



An Able Star rocket of the type which seemingly exploded in orbit following the successful launching of a triple satellite payload on Jne. 29. Its first stage booster was a modified Thor IRBM.

The 100-lb. Relay satellite will be launched by a Delta rocket into an elliptical orbit with a perigee of nearly 900 miles and an apogee of some 3,000 miles. The orbit will be inclined at about 48° to the equator.

With a somewhat barrel-shaped appearance, the satellite will be 29 in. high and 26 in. in diameter, excluding aerials. Approximately 6,000 radiation-protected solar cells mounted on the sides of the body will serve to energize the internal equipment. In the interests of reliability, the satellite will contain two communications transponders, each capable of receiving and transmitting television, two-way telephone, or other forms of wide-band data. Ground communication stations will select the transponder and its mode of operation for any given transmission.

The transponders will receive the transmitted information from the ground on a planned frequency of 1,725 Mc/s. After the transponder amplifies the signal it will be retransmitted to the ground at a frequency of 4,170 Mc/s. by a 10W. travelling wave tube being specially developed by R.C.A. for the Relay satellite.

In addition to the primary communications equipment, instrumentation will be carried to measure the intensity and distribution of high and low energy electrons and protons in the space environment and to determine the extent of damage that these particles cause to semiconductors such as diodes and solar cells. Other satellite-borne instrumentation includes two command control receivers and decoders (which will be used to operate the electronic equipment via a radio control link from the NASA Minitrack network) and a pulse-code telemetry system to transmit performance data on the satellite's equipment and radiation experiments. In addition, a VHF transmitter will provide a tracking signal to permit the satellite's orbit to be computed by the Goddard Space Flight Center.

The ground stations will experiment with the latest and most advanced equipment, including large area receiving and tracking antennae, helium-cooled MASERS and solid-state receivers.

Probing the Sun

A 250-lb. space probe, able to send an uninterrupted stream of scientific data from close to the Sun's surface, was described by Mr. D. H. Dickstein of the General Electric Company at a recent joint meeting of the Institute of Aerospace Sciences and the American Rocket Society.

The proposed vehicle would be launched into an elliptical orbit, the closest point, or perihelion, of which would be about nine million miles from the Sun. The probe would return to the Earth's distance (92,900,000 miles) at the orbit's aphelion, and would circle the Sun once every five months. Mr. Dickstein said that the Saturn rocket scheduled for use in about 1965 could be used for launching such a probe vehicle.

Once the probe was in orbit and separated from the carrier rocket, a system of Sun or star trackers and gas jets would provide initial orientation. From there on the space vehicle would be held steady by a combination of orbital forces and the "pressure" of the Sun's rays.

The probe would have a central cluster of equipment which

includes a dish-shaped solar collector aimed into the Sun, and a system for converting solar energy into electrical power. Telemetry equipment, the initial stabilization system, power converters and scientific instrumentation would be contained in two cylindrical pods at the ends of two booms extending outward and toward the Sun from the central cluster. Passing through the central cluster would be a long antenna aimed at all times toward the Earth.

Half the weight of the probe would be in the equipment pods at the ends of the booms. With the solar collector located behind the probe's centre of gravity, the "pressure" of solar radiation would hold the collector facing the Sun. The mass of the extended pods would also prevent spinning. Adjustable shutters in the sides of the equipment pods would control the probe's temperature, excess heat being radiated into space when the shutters were open.

The telemetry equipment proposed in this scheme is a pulse code modulated system with phase shift keying (PCM PS) based on a "Synchrolink" system now being developed by General Electric. This system is claimed to have an extremely high theoretical efficiency.

Mr. Dickstein said that a thermionic power conversion system had been selected because it could operate at the high temperatures to which it would be subjected near the Sun and over the wide range of solar flux levels encountered throughout the highly elliptical orbit. The more widely used photovoltaic cell system would, he said, degrade at those temperatures. The power conversion system proposed here was unique in having its diodes arranged in a flat plate which could be moved in and out of the focal point of the solar collector. Other systems have the diodes arranged on a concave surface.

One object of the probe would be to investigate the interaction between magnetic fields and charged particles within the orbits of Venus and Mercury.

Advent—a Satellite for Military Communications

FOLLOWING hard on the heels of the Midas and Samos surveillance and reconnaissance satellites comes a new U.S. military satellite system, Project Advent. This time the rôle is communications as a means of providing World-wide instantaneous contact between remote outposts of the armed forces. The initial object is "to conduct the requisite research and development for demonstrating the feasibility of a microwave communications satellite system."

In addition to the satellites, the system will include two ground stations in New Jersey and in California. A U.S. Navy shipboard terminal will serve as a third station at sea operating in many parts of the World to test communications capabilities.

The space satellite and associated equipment is being developed by the General Electric Company under the technical direction of the U.S.A.F.'s Space Systems Division. As systems integrator of the Advent programme, the division is also responsible for the development, fabrication and launch of the booster vehicles.

An operational Advent system would require a minimum of three satellites to orbit the Earth's equator at a height of 22,300 st. miles and a speed of 7,000 m.p.h. Such an orbit will synchronize the satellite's movement with the Earth's rotation and each satellite will remain essentially "fixed" over a given point on the Earth. In this way virtual World-wide coverage could be achieved and maintained.

Other communications satellite systems tested in orbit have involved passive satellites (Project Echo) which reflect radio signals beyond the curvature of the Earth, and delayed repeater satellites (Projects Score and Courier) that receive and store information until commanded to transmit it.

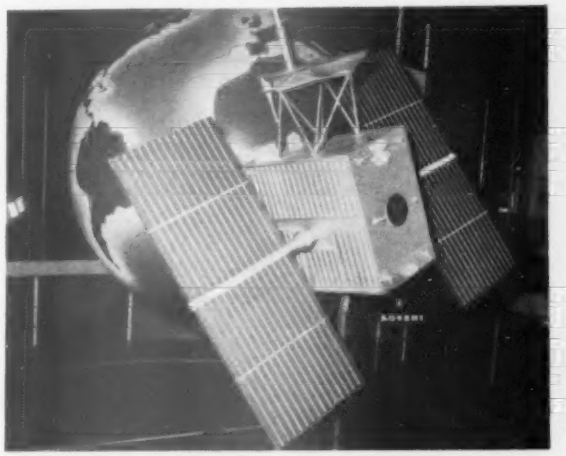
In the Advent system the signal beamed to the satellite will be received, amplified and relayed instantaneously by the satellite to the receiving station. High-speed radio teletype and voice broadcasts will be transmitted simultaneously.

General Electric's responsibility for the "orbiting hardware" includes development of the satellite vehicle and its associated electrical supplies; attitude control; propulsion; and tracking, structure, temperature and electronic control sub-systems. The satellite will consist basically of a vehicle body, two solar cell paddles and Earth-orientated antennae.

At the end of a series of experimental firings using progressively more powerful boosters, the communication satellite will be ultimately launched into a 24-hr. orbit. During the preliminary test phase an Air Force Atlas Agena B will be employed to boost the satellite into orbit with the Atlas Centaur programmed for the final test series. During launch, and until booster burn-out, the satellite will be covered with a fairing; once it has achieved orbit, the two solar cell paddles and the antennae will become operative. After successful injection into orbit, orbital control will be assumed by the U.S. Air Force.

Primary power will be provided by solar energy which will be converted into electrical energy by thousands of silicon photovoltaic cells built into two laminated paddles. Temperature on the illuminated side of the paddles is expected to be 100° F. or more, while the temperature on the "shadow" side will be about −200° F. The paddles will be free to rotate and will be continually orientated toward the sun by a General Electrical Sun-tracker. When the vehicle is in the Earth's shadow, power will be drawn from nickel-cadmium batteries.

The satellite will have a 28-volt system. Its solar cells and storage batteries will be grouped into several cell-battery units, each feeding the main power lines as a means of enhancing reliability.



This mock-up of Advent shows the disposition of the solar paddles, the temperature control louvres, and the Earth-orientated antennae.

The Advent satellite will be able to adjust its position to synchronize with the revolution of the Earth. This station-keeping function will be achieved by a combination of propulsion, attitude-control and tracking capabilities. Impulse will be provided by a thrust device pointed in a precise direction by the attitude-control system. A tracking signal will be provided to permit calculations of necessary corrections from the ground.

Horizon sensors sensitive enough to detect the heat of a body at −10° F. will keep the satellite's antennae continually directed towards the Earth. Vehicle motion, to maintain proper paddle orientation, prescribed orbit and antennae alignment, will be supplied by external jets. The satellite will perform positioning manœuvres continuously while in orbit.

As temperature environment is extremely important to the proper functioning of electronic components, temperature controls are being developed to maintain internal operating conditions between 50° and 70° F. This will be achieved by special thermostatically controlled louvred vanes which limit internal temperature by compensating for effects of Sun and equipment heating.

The vehicle will also contain receivers and transmitters for microwave communication with ground stations and telemetry equipment for reporting data to ground-tracking stations and for receiving signals in return. Communication and telemetry antennae will be located on one end of the satellite; the telemetry antenna will be mounted on a retractable rod. For the communication function, a high-gain antenna will be used to provide contact with Earth-based stations.

Stringent reliability requirements are being imposed on the Advent satellite, which is being designed for a mean operating life of a full year without failure. The satellite package must also be capable of withstanding severe shock and vibration conditions of rocket boost at launch, and to operate in an environment of intense radiation and extreme temperature variations of from −460° F. to +200° F.

Air Transport in Northern Norway

by Roy Owen

IN these days of high-altitude flying, with jets operating into ever larger airports, it was a pleasant change, towards the end of the winter snows, to revert to the more "old-fashioned" type of flying, albeit much mileage was covered in Viscounts. Such flying can be found by going north from Oslo, travelling to Bardufoss on an S.A.S. service operated by Viscount 779Ds on charter from Fred Olsen, and also on the seaplane routes of Wideroes Flyveselskap.

These routes, although maintaining schedules well, considering the conditions at times encountered, retain an unhurried air and personal touch which seem to get lost when dealing with large numbers of aircraft, passengers and crew at the contemporary concrete deserts built to handle intercontinental traffic. Perhaps this atmosphere is helped by the number of regular travellers, who become "one of the family."

Whatever it is, it is most relaxing. Admittedly, some of the passenger accommodation is a little cramped, particularly at Bardufoss, but no one seems unduly perturbed, least of all the passengers.

On the trip that the writer made, a departure was made by Viscount from Oslo at breakfast time. By the time that we were overhead Koppang, the stratus into which we had soon climbed when leaving Fornebu Airport, dispersed, and there was clear weather for the rest of the north-bound trip.

The first stop was at Vaernes Airport, Trondheim where, although the town was still covered with early morning fog, the field itself was in the clear. A visual approach was made from Graakallen beacon on to R/W 07. This runway was shortly to be closed for lengthening, work which involves the diversion of a river and the construction of a mole. While this work is in progress, R/W 14/32 will be the main one in use which will involve some interesting flying.

For R/W 32, an approach to R/W 09 will be made, followed by a turn to starboard over the gap between two hills, each of which rise to about 700 ft., on the south side of the fjord, then a left turn, keeping a 400+ ft. hill to the left, and then over the river to the runway. Take-off for R/W 14 will involve an immediate left turn, at least Rate 1, through about 270° so as to head back down the fjord. This manœuvre takes one directly towards high ground with a spot height of 800 ft., and over the lower slopes of this steeply rising ground.

The flight then continues northwards on Airway Amber 7, with rugged, desolate snow-scapes below. On the way to Bodø it passes over the Arctic Circle at Bronnoysund, a clearly defined inlet, while a short distance to the north east can be seen the large glacier of Svartisen. As the weather was clear, a visual approach was made to Bodø from Støtt beacon, instead of going up to Fleinvaer which is necessary when making an instrument approach. For these parts, the approach and take-off are straight-forward.

The mountains behind Narvik, as seen from a Norseman floatplane on Wideroes scheduled Harstad-Narvik service.

The next, and final stop, at Bardufoss, with its one runway, is the *pièce de résistance* on this flight. The ILS has no glide path, and the localizer, which has bends in the beam beyond the beacon and outer marker at Sörreisa, is not aligned with R/W 11. It serves only as a track guide towards the runway which, if one is making a visual approach, one sees on about the only piece of flat ground (and appearing none too large at that) for miles around.

To the left is ground rising to over 1,500 ft. within four miles of the runway centre-line, while to the right there is a spot height of over 2,000 ft. about three miles from the approach path, rising to over 3,000 ft. One also discovers a hill (not shown on the landing charts) about 200 ft. high on the approach path, and this hill starts its drop to runway level about 5-600 yd. from the threshold.

In case of overshoot, or take-off on R/W 11, a smart left turn is made, avoiding Storhaug, an 840-ft. peak, by going "behind" it, turning away from the ground not very far beyond which rises to over 2,400 ft. To the south of the runway are circling lights for use when a landing has to be made in hours of darkness on R/W 29. In this case one flies down to 2,000 ft. on an approach to R/W 11 until the approach lights are reached, holding this height while following the circling lights, and a descent started on base leg if visual contact is maintained.

Before rejoining the southbound Viscount, it was decided to see how Wideroes operate. This company was formed in 1932, and is Europe's largest operator of seaplanes, their well-equipped base being at Tromsö. Scheduled passenger trips are only made in the summer season, when the route extends northwards from Tromsö to Alta (of Bismarck fame), Hammerfest, Vadsö and Kirkenes, which is but a few miles from the Russian border.

One of the four Noordyn Norseman floatplanes operated by Wideroes Flyveselskap. It is seen at its moorings off Harstad.

At peak periods, 64 scheduled sectors are flown each day resulting in a mileage equivalent to the distance from Oslo to Khartoum. Flights are also made for cargo, mail, sports teams and hunters.

The isolated communities in this part of the country also rely on Wideroes for ambulance flights, especially in the winter, and in 1960 the company made 323 such trips from the ambulance bases at Narvik, Oslo, Tromsö and Trondheim. The company can guarantee that if the conditions permit a trip, an ambulance flight can be airborne within 45 minutes of a call being made.

The fleet is varied, but the passenger flights rely on the four D.H. Otter and four Noorduyn Norseman single-engined seaplanes. A Douglas B.26 Invader, based at Tromsö is only used for photo survey work, mainly around Spitzbergen. Wideroes also operate two Lockheed Electras—the original version—for passenger charter and air survey; a Cessna 180 which can be used for air taxi work, but is mainly used as the "school" aircraft, and a Sea Bee, which is based at Trondheim.

In view of the specialized knowledge required for flying in this area, captains must have a minimum of about 2,500 hours flying in northern Norway before obtaining a command. Even if a pilot joins the company with the requisite experience, at least two seasons must be spent in the right-hand seat before obtaining a command.

In good weather, direct flights are made whenever possible, and any time thus saved is utilized for sightseeing, as the company considers that they should give their passengers every opportunity to see the truly wonderful scenery on their routes. In poor conditions, "fjord-crawling" (for want of a better term) is employed, and the hard-won local knowledge is used to the full. The route books used by the company are unusual in that shipping charts are mainly used, with sections of topographical maps stuck on the pages for any particularly difficult points. In this area there are few NDBs of any use, so the old arts of flying are well to the fore.

Flying with Wideroes, one puts the clock back about 20 years. They believe in the kind of flying that many passengers today have not had the good fortune to experience. Not for Wideroes are the niceties of 34-in. pitch seating and IATA-specified sandwiches. One clambers aboard with a few other passengers (the maximum load on the Otter is 10), settles down, and is then transported surely, if not swiftly by jet standards. This flying is adventurous, so long as one does not consider that "adventure" is synonymous with "danger." The nearest equivalent to this type of flying in the British Isles is probably that of B.E.A.'s Scottish flights with the Herons.

At Tromsö, all passengers go direct to the seaplane base at Skattøra, at the north end of the island. I was told to take the 13.00 hrs. bus from the Market Place. To my consternation, this bus didn't reach the base until five minutes before STD. However, this was apparently quite a normal procedure, and the S.A.S. Traffic Officer calmly checked me in for the flight, and asked me to go to the aircraft at the end of the jetty. Just like London Airport!

The first officer had already completed an engine warm-up and check, and when Capt. Svensson came aboard we were pushed away from the jetty, the engine started and were quickly airborne, climbing and turning over Tromsö town and setting course for Rystraumen. As the weather deteriorated as soon as we had passed the town, we flew at about 2,000 ft., just under a ragged layer of stratus from which snow came at irregular intervals. We followed the water all the way, as the tops of the mountains were covered with the stratus, to Lenvik, Finnsnes, Solbergfjord and so to Harstad.

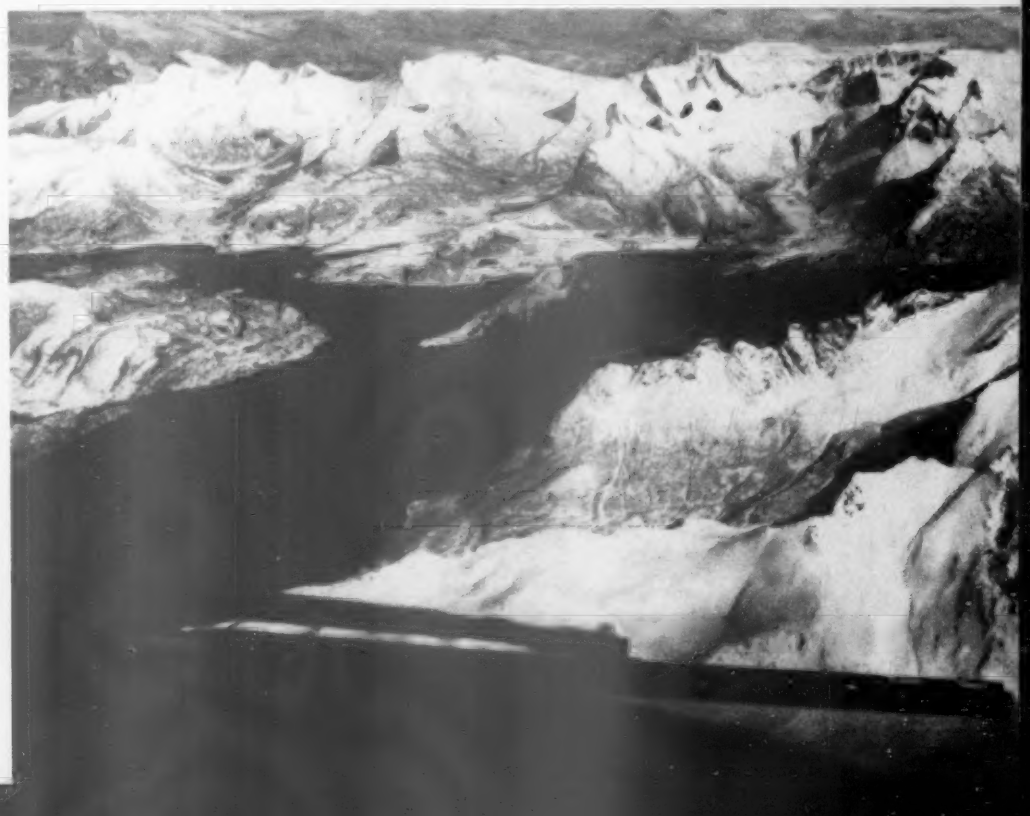
After landing at Harstad, the full meaning of basic air transport became apparent. The First Officer appeared and disinterred some wire rope from the aft cargo hold. He then disappeared through the door hatch on to the float, and made the seaplane fast to a buoy in the middle of the inlet. After a few minutes, an old motor boat, manned by B.P. personnel, with two 50-gallon drums of fuel on board, came alongside to refuel the Otter. Also the safety boat appeared; this serves as the passenger, crew and cargo launch. We then had a very cold five-minute trip to the town quay.

At the town terminal, which also seems to serve as a bus station and a local meeting place for a quiet chat, a small office is set aside for the one and only S.A.S. Traffic Officer. After dealing with the incoming cargo, he processed the joining passengers, prepared the ship's papers and led the passengers to the motor boat. We first transferred the crew and load to the Otter for its return trip to Tromsö, and then proceeded to the Norseman which was operating to Narvik, with Capt. Lohne in command.

After the Norseman was cast loose from the launch the engine was started, and we motored around the inlet for a few minutes to warm up the oil. Take-off was made toward the open water (there being a 2,000-ft. hill behind us), the Norseman becoming airborne at 90 kt. I.A.S. A climbing, left-hand turn was made over the town of Harstad, and we settled down to a climb at 100 kt. to 4,500 ft., flying towards Vågsfjorden and Bogen. When we passed over the western shore of Ofotenfjord, a slow descent was made towards Narvik.

As we had made a direct flight instead of using the bad weather (and longer) route via the fjords, some time was in hand, so Capt. Lohne levelled off at 4,000 ft. and flew up the fjord south of Narvik for some sightseeing. An approach was then made at 200 ft. down the fjord, and immediately after landing near the jetty almost full power was applied to keep the aircraft "on the step" at about 40 kt. whilst taxi-ing in. So ended a 35-min. trip, which really allows passengers to enjoy flying, and sightseeing, to the full.

It is good to experience such flying these days, when the emphasis seems to be on faster and larger aircraft, which tends to make one forget that travel by air can still be an interesting and delightful experience.



Seen from a Fred Olsen Viscount 779D—Bronnoysund which is on the Arctic Circle.

Personal Flying

Wanted: a Ministry of Drivers

SINCE the Ministry responsible for civil aviation has received quite a quota of criticism during the past few years it is only fair to record a few actions or inactions which may be considered to have redounded to their credit.

Their concern for the safety of flying is well known, and if that concern frequently drove them to impose extraordinary degrees of frustration on the activities they were meant to encourage, then at least one could appreciate that their regulations were made, and their actions taken, in ignorance rather than out of malice.

Since it was earlier a Ministry of Transport as well as of Civil Aviation much credit must be conceded to them for not applying their aviation regulations unwisely and blindly throughout the whole field of transportation. Had they done this the daily papers would have recorded some surprising decisions and convictions.

For instance, it would have been comparatively ordinary, albeit surprising, reading in the morning papers to learn that some erring citizen had been convicted because a policeman, on checking his driving log book, discovered that he had failed to enter up a journey to Brighton which he had made on the previous week-end in his Morris Minor. The Ministry having decided that motorists who drive continuously on the narrow roads of England at speeds between 50 and 100 m.p.h. must record, for ministerial information and inspection, every journey they do (within 24 hours of making the journey) in order to ensure that they keep themselves in practice. A renewal of the driving licence would not be issued without this information being supplied to the appropriate authority. This might be considered to be just as important an obligation as the existing one on private pilots who are now required to record every journey they do immediately on completion of it, and whose licence will not be renewed until their flying log book has been inspected by the Ministry. In the case of pilots, of course, it must be appreciated that in making journeys by air they habitually incur the fantastic risk of coming to, and going from, large flat open areas at speeds of approximately 45 m.p.h. The Ministry feels it would be inviting disaster if pilots were allowed to attempt this feat upon their own responsibility without regular ministerial supervision and interference.

Again some little astonishment might have been caused by an announcement in the papers one morning that, due to a report of two near misses by drivers of No. 9 buses and another report of a near miss by the driver of a No. 38 bus—in all cases with private cars—the whole area within half a mile either side of Piccadilly would be closed to private car traffic. Such a regulation would, however, not be absolutely comprehensive, since military traffic would be permitted to continue travelling in any direction, on either side of the road, at any speed provided that 30 minutes prior warning were given to Scotland Yard. Thus Scotland Yard would be able to notify the Transport Commission, who would notify the bus company, who would notify their drivers that such a hazard was about to take place—or had already taken place.

In view of the important relationship, between the responsible department of the Ministry and the bus drivers, it would be explained that arrangements were in hand for that ministerial department to move into a few vacant offices on the fifth floor (back) of the building occupied by the Transport and General Workers Union. This move would bring road transport arrangements in line with those relating to civil air transport wherein, for many years now, the responsible branch of the Ministry has been operating as a small accessory department within the British Air Line Pilots' Association.

After these, and similar, news items had been absorbed on frequent occasions little concern would be expressed when a further ministerial announcement was made to the effect that, since records showed that 40% of the municipal car parks were unlikely to show a profit in the immediate future, the areas would be sold for building sites or converted into children's playing fields if local opposition proved too embarrassing. It would, of course, be accepted that the few remaining parking areas would be overcrowded but this eventually would already have been taken care of by ministerial insistence on every car park having a full complement of ambulances, fire tenders and crash equipment.

The roadworthiness of vehicles has, for many years, been a source of ministerial anxiety, but fortunately legislation has already provided some measure of reassurance here, since all road vehicles are now required to be provided with a Certificate of Roadworthiness—the inspection to take place after the vehicles have been on the road for 10 years.

Another typical announcement might well have been made. Learning to drive has always had its hazards but, following aeronautical practice, the Ministry will itself in future take a hand in ensuring the diligent prosecution of all errors committed by L-plate drivers. A significant achievement in this aspect of the ministerial drive for safety (and encouragement) has been made recently when a local magistrates' court fined an L-driver £50 for losing his way in some country lanes in a strange locality. It was possible that the magistrates would have dealt with this case as leniently as they had with the previous cases that morning when charges of thieving, forgery, assaulting the police and robbery with violence were met with an average fine of £20, but the solicitor prosecuting on behalf

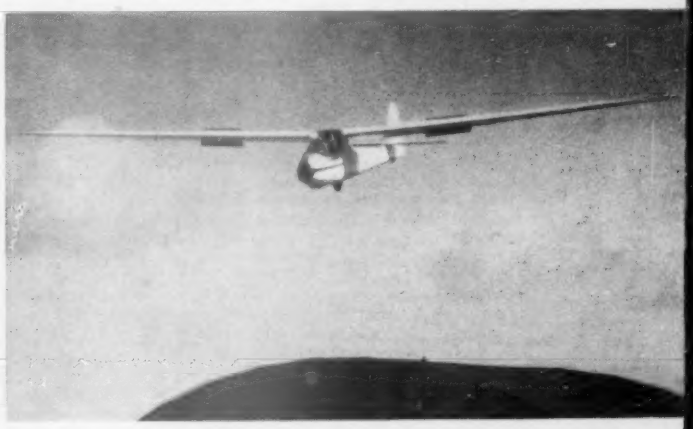
FIRST ON THE REGISTER.—This Temco D.16 Twin Navion has been assembled and completely overhauled by Yorkshire Light Aircraft Ltd., at the Leeds and Bradford Airport, after shipping from New York. With two 150 b.h.p. Lycoming engines, it cruises at around 170 m.p.h. Still air range is 1,050 miles with internal tanks. Equipment includes autopilot, twin VHF transmitters, automatic radio compass and VOR navigation system. The two-blade Hartzell propellers are fully feathering. Price £12,000 upwards depending on equipment.

of the Ministry managed to convince the court that pupils losing themselves in country districts opened the way to a number of unimaginable public dangers.

Fortunately few of these frustrations have yet been imposed on road users, since the Ministry of Transport take the considered view that there is no urgent action necessary comparable to that required by the Ministry of Aviation for air travel in small private aeroplanes. On the roads, averaging 20 ft. in width, closing speeds of approaching cars (occasionally round bends) still seldom exceed 150 m.p.h. and the death rate on the roads each month is still only counted in hundreds. When one compares this record with private air travel, when as many as 10 people may be killed yearly, where aircraft flying in opposite directions have only 300,000 cubic miles in which to operate, and when pilots approach the ground for landing at speeds of approximately 45 m.p.h. with only a 300-acre flat, clear area to arrive on, then the ministerial line of thought can be appreciated at its true value.—"CANUTE."

Gliding Notes

by Dr. A. E. Slater



East German gliders are very popular in Denmark, because of their quality and low price. On the left two machines owned by the Aviator gliding club of Aalborg; in the foreground a Libelle single-seater and behind it a Lehrmeister two-seater which is seen in flight in the picture on the right. Nine Lehrmeisters are now flying in Denmark.

BOSTON was the goal for a 74-mile race on the opening day of the Northern Gliding Competitions at Camphill on Jly. 30, and 31—more than half the field—got there. Their main difficulties were at either end: contacting a good thermal from the winch launch, and recognizing the grass airfield two miles short of Boston which is small and inconspicuous.

At the briefing, when low stratus covered the sky, Peter Wickham, who is an instructor in meteorology at Stanmore, assured us that the weather was fine over all the rest of England and Wales. This reminds one of a particular day during the World Championships of 1934, when the rest of England had lovely cumulus, including even Sheffield, but the Camphill plateau had only low stratus and drizzle.

This time, however, the weather cleared by 13.00 hr., when cumulus clouds appeared and "Chuck" Bentson of London Club and Humphry Dimock of Portsmouth R.N. were soon off to Boston, the former making second best speed of 33.6 m.p.h. Alfred Warminger of Norwich, who made best speed of 35.6 m.p.h., and D. Innes of R.N. Arbroath, third best with 31.3, were launched around 14.50. Next in order of speed were Don Snodgrass of Lasham and Geoff Nixon of London, each making his third attempt to get away; they had almost the last launches of the day and landed at Boston at 19.00, averaging 30 m.p.h. All the machines to reach Boston were Skylarks except the fastest, an Olympia 419, and the slowest, an Olympia 2b.

The Hope Valley cement works chimney, at the north end of the slope, was belching forth smoke, and drawings of it which I made from 14.42 to 15.42 showed two periods, 40 minutes apart, when the smoke went vertically upwards, and lesser thermals, weaker and wider, at intervals of five to eight minutes. Throughout the launching period of four hours, spells when launches led to cross-country flights began just about every 40 minutes, which seems thus to have been the characteristic convection cycle for the day.

The first vertical-smoke period, 14.42-44, happened during an eight-minute lull in winch activity, but the next launches were the successful ones by Warminger and Innes. The smoke was also vertical from 15.20-22, in the middle of a period from 15.17-32 during which seven launches all led to cross-countries, two to Boston and three others of over 60 miles.

The second day, Jly. 31, suffered from clamp in the middle but produced soarable periods at either end. There was a vague mixture of low, medium and high stratified clouds during the mid-day hours, which appeared on the weather chart as a cold front, so nobody went away in the morning soarability, because the post-frontal sky, when it came in late afternoon, should theoretically have been worth waiting for. It wasn't all that good when it came, but eight people got away on a "free distance" task, five of them far enough to score.

Mike Bird, of the London Club, in a newly acquired Skylark 3f, got his greatest height, 2,800 ft. above start, between Chesterfield and Mansfield, and thereafter made a long flat glide in "reduced sink," steering over built-up areas and finally crossing Nottingham to land on its far side—39 miles and the best distance of the day. A cheap pair of coloured glasses enabled him to see, much more clearly than without them, where the haze was going up in thermals, especially over Nottingham.

This put Mike Bird in the lead after the first two days with 181 points; Warminger's Olympia 419 and the Army Club's Skylark 3F, flown by Stuart Morison and P. Hanneman, shared second place with 161 points each. Another Army Skylark was fourth and one from R.N. Arbroath fifth.

* * *

WHAT is, or are, "slurps"? According to Prof. J. S. M. Macdonald, chairman of the Department of Meteorology at McGill University in Canada, the word, which he calls a "modern abomination," describes the process whereby "the heated air breaks away in sizeable blobs or bubbles, to be replaced by cooler air that descends to take its place."

Prof. Macdonald has sent a copy of an address which he gave to a body of people concerned with the prevention of forest fires, in which he quotes verbatim a description of the latest explanation of the cause of lightning, published here in "Gliding Notes" on Mar. 3, in preference to commenting on it himself.

He also mentions a new explanation of why cumulus changes from the simple to the cauliflower-like "congestus" kind in a layer into which air is flowing from all sides, which his "McGill Group" has proposed. He says that the layer does not lift as a whole, but only in the small areas where cumulus clouds occupy 10% of the full area; so the cumulus tops rise 10 times higher than the top of the layer would rise if all of it was lifted to accommodate the inflowing air.

Correspondence

More Vostok Speculations

PERHAPS a few points can be added to your correspondent's remarks on the appearance of the Vostok (THE AEROPLANE AND ASTRONAUTICS, Jly. 20, p. 85). First, while admitting that an annular tail is surprising, a possible interpretation is that the designers found it prudent to allow for the vehicle falling away after an abortive launch to be stabilized in the interests of ejecting the inner man-carrying capsule. Further, a peripheral forward-facing location is logical for the retro and roll control vernier nozzles which seem to show up in your photograph (Jly. 13 issue).

Secondly, what looks like a circular window-well behind the nose cone is also probably an ejection hatch for emergency use. The inference is that a prone or kneeling pilot looks down into the well through a port in his capsule until he somersaults through 180° backwards to accept the retardation forces on his rump! The technique of re-entering the denser layers of the atmosphere adopted would seem to owe something to the well-known discarding sabot technique of tank gunnery. For example, assuming the shell fairing displayed at Tushino is quite thin and disappears literally in a flash, the very bulk could still have been responsible for dissipating enough of the energy of motion for the remainder of the deceleration and landing loads to be handled by a single stowed capsule parachute. The sabot casing, which leaves the round from the muzzle, has an exactly opposite effect to achieve the highest velocities.

Thirdly, it is worth reminiscing that the lines of the winged sling for air-launching, which made a brief appearance in an early Russian film release (see THE AEROPLANE, Dec. 13, 1957), were rather strikingly similar to a double Bounder bomber, complete with eight jet engines and intakes of too early a vintage to have received shock cones. The size and speed of such a composite booster satge would seem about adequate for the task up to Vostok weight and perhaps beyond at roughly half the vertical launching cost in fuel and engineering.

Cirencester, Glos. G. B. BATHURST.

IN reply to Mr. G. B. Bathurst's letter (in the issue of Jly. 13), I would like to clarify a few points concerning my theory on the configuration of the Soviet space-ships.

First, the mounting of the ejectable dog-capsule. In the cut-away diagram the dogs stand (or lie) along the capsule and not across it, and in a vertical launch this would necessitate the mounting of the capsule across the space-ship in order to combat the *g*-forces on the dogs. The capsule is mounted on rails and can eject through one of two hatches. What more natural than that the rails run across the ship, ending against a hatch on each side of the ship? The recently released pictures of Vostok show a large circular hatch—tending to confirm this.

I am not sure which picture Mr. Bathurst refers to when he speaks of the exterior of an orbital cabin capable of carrying a man. If he means the cabin or capsule which carried Belka and Strelka in Space-ship II, and which I have been discussing above, this is much more nearly cylindrical than conical, and the weight is clearly distributed more or less evenly along its length. If this is not the picture to which Mr. Bathurst refers perhaps he can enlighten me, for I know of no other.

In support of the vertical-launch supposition, we now have Major Gagarin's account of the launch, including his description of the rocket standing upright on the launching-pad "like a gigantic beacon," and of the separation of the various stages during the boost-phase (though he does not say how many!).

It would appear that I was wrong in my assumption that the space-ships are winged (though I may draw consolation from the fact that I was not alone in this), unless, that is, the ring at the rear of the ship is an annular wing, though it seems much more likely that it serves just to carry the retro-rockets (there are four cylinders mounted on the ring). If so, the ring is jettisoned before re-entry and could not give the ship any aerodynamic lift; it would seem to prove, however, that the space-ships do not re-enter "backwards."

Dare we assume that the vehicle shown at Tushino was the actual Vostok itself, and not just a model? I am going to assume so for the sake of argument, and I have drawn the following conclusion from a study of the photographs of the craft.

A dividing-line is just visible about one-third of the length forward of the stern, showing the division between the recoverable cabin and the jettisonable instrument section. This is confirmed by recollection of Space-ship I (Sputnik IV), the cabin of which was considerably heavier than the instrument section. The position of the cables suspending the craft beneath the Mi-6 helicopter show the centre of gravity to be set rather far forward, which is probably what one would expect, bearing in mind the component weights.

Two things about Vostok rather surprise me. One is the simple cone-cylinder configuration of the vehicle, which contrasts with the much more streamlined appearance of other Soviet rockets. The other is that Major Gagarin mentions the ejection of a nose-cone during the launch.

I would be very interested to learn Mr. Bathurst's views on the vehicle shown at Tushino.

Dolgellau, Merioneth. LIONEL S. BUTCHER.

Sunderland Production

IN Mr. Powell's letter headed "Sunderland Highlights" he mentioned that these flying-boats came from the Dumbarton and Brough factories of Blackburn Aircraft. In fact, all 250 Sunderlands built by Blackburn's were constructed at Dumbarton, although a few pressings were carried out on a sub-contract basis at Brough.

It is of interest that the day the last Sunderland left Dumbarton the first of 18,000 prefabricated houses also left the factory.

Brough. M. G. K. BYRNE,
Sales Manager,
Blackburn Aircraft, Ltd.

Occupational Health Risk

NO doubt Capt. Cane is right about the exact hours of pilot utilization on which the early Comet operations were planned, but I am afraid that I must maintain my theme that, as a result of an increase in petty sickness, medical opinion advised a reduction in monthly hours. In journalism, I am told, it is usually a mistake to compromise one's source of information, but I am supplying this privately to Capt. Cane and think that he will be satisfied as to the authenticity.

However, if there has been any misunderstanding on this point, I can only suggest that it underlines the need for the objective analysis and publication of sickness statistics as related to aircrew. This was indeed agreed to at the ILO Ad Hoc Meeting on Civil Aviation, held in Geneva in September, 1960, where the following comment was made in the report and unanimously endorsed by the representatives of governments, operators and workers:

"There is a need for all information which is acquired as a result of this work on occupational health risks in civil aviation to be made available. . . ."

Most of the leading operators of the World were at this meeting; but I haven't seen any reports from them yet.

High Wycombe, Bucks. C.C.J.

Realistic "National Pride"

IN your summary of investigation findings (issue of Jly. 13, p. 34) on the Hermes accident at Southend, you express the belief that this is the first official investigation to isolate "aqua-planing" as the cause.

This is not quite correct, since an accident to a Constellation at Charleston, West Virginia, in May, 1959, resulted in a C.A.B. report (File No. 1-0055, released Jne. 10, 1960), specifically citing aqua-planing, although with additional comment on certain crew deficiencies.

I would like to comment also on the Editorial in your Jly. 13 issue. Your comments under "Implications of Strategy" and "Helicopters for Airlines," whilst containing much that is above dispute, in my opinion suffer from the perhaps misplaced "national pride" aspect which has crept in.

First, you say that "Air Supremacy can only come from consistency in planning and that is something this country has lacked for far too long." I doubt whether anyone would disagree with the greater part of this sentence, but any planning must have realistic objectives. So what form is this U.K. military "Supremacy" to take? Supremacy as compared with the Russians? (a pipe dream). Compared with the Americans? (also a pipe dream, in addition to being quite unnecessary). Supremacy, perhaps, as compared with any other European nation? This, it is to be hoped in this age of NATO and Common Market moves, is not a future requirement. Thus it might have been better for your Editorial to have focused attention instead on the wider problem, the incredible waste of productive wealth which in 1961 is still an unfortunate characteristic of our Western World, pointing to the need for some overall planning which will enable an efficiently organized

U.K. industry to attain reasonable objectives and a fair share of the total effort of the Western Alliance.

Secondly, you say that if the Boeing-Vertol 107 helicopters supposed to be ordered by B.E.A. and Sabena are fitted with British engines, then B.E.A. should service those engines. This again is "national pride" breaking through. Whilst it is indeed lamentable that years of messing about with helicopters in this country have little to show in the civil sense ("commercial" will be an inappropriate word for some time ahead), you must surely realize that the economics of helicopter operation make minimum maintenance costs an imperative. Therefore, British engines or not, there is only one requirement here, that the maintenance arrangement in this B.E.A./Sabena tie-up should be a minimum. This consideration cannot ignore the fact that engine changes and the like must be integrated with other aspects of maintenance.

Let it not be construed that national pride is considered to be necessarily a bad thing. But let it be tempered by a realistic appreciation of our position in the wider context of the West's economic and political aims.

Bristol. NEVILLE H. WOOD.

Friendship Progress

A READER of your news item "Fairchild F-27s Continue" on page 66 of the Jly. 20 issue may be left with the impression that Fairchild, the licensees, are well ahead of Fokker, the designers, in the exploitation of the F-27 Friendship's potential. This is not true.

As announced in your issue of Jne. 8, approval under the Netherlands R.L.D., British A.R.B. and ICAO rules for a gross take-off weight of 42,000 lb. has already been obtained for Fokker-built Friendships with Dart R.Da.7 engines. F.A.A. regulations, however, allow a gross take-off weight of only 1.05 the maximum landing weight without a fuel dumping system being installed.

Under the rules obtaining in Europe, a factor of 1.15 is permitted which means, with the 37,500 lb. maximum landing weight, we can obtain 42,000 lb. gross take-off weight with ease. Fairchild, however, can only go to 39,400 lb. with the same maximum landing weight and have now embarked upon the development of a fuel jettison system to obtain full benefit from the work on the certification at 42,000 lb. which Fokker have already done.

The new F-27G freighter is not new in the sense that it is a freighter, for the necessary engineering changes to suit the Friendship to freight and mixed passenger-cargo operations were made by Fokker a long time ago and both Fokker and Fairchild have supplied these special versions, known as Freightships, to several companies. The F-27G, however, will have optionally increased fuel capacity, in the form of bladder tanks in the wing centre section (in Fokker-built aircraft this is kept free of fuel), to suit its maximum range capabilities to a possible U.S. military requirement.

One further development in progress here and expected soon to be approved is the raising of the cabin pressure differential from 4.16 p.s.i. to 5.4 p.s.i., to allow an increase in cruising altitude from 20,000 ft. to 25,000 ft., with no increase in the cabin altitude of 8,000 ft. When this is officially approved, Fairchild will, no doubt, make use of this latest Fokker advance.

N.V. Koninklijke Nederlandse Vliegtuigenfabriek Fokker — ROBERT R. RODWELL, Public Relations Dept.

Slush and the Munich Accident

LEST the problems of the Munich air crash of February, 1958 (B.E.A. Elizabethan G-ALZU) become conveniently shelved on the premise that three-and-a-half years is ample time in which to let the matter die a natural death, this Association states its case for the present record.

We contend that the primary cause of this accident was the retarding effect of slush on the runway. We adhere to this opinion and always have supported it. Over the years our opinion has been backed by official pronouncements on the subject; notably the Ministry of Aviation's Information Circular No. 8 of 1961. The Circular was a very necessary document, which dealt comprehensively with measures for dealing with the problem of take-off from runways covered with snow, slush or water, and BALPA gave it full support, but at the same time expressed surprise that the research which had gone into establishing the factors used in the Circular was not applied to the performance of G-ALZU on a slush-covered runway.

This is something which can and must be done. Until some official and authoritative examination of the cause of the accident is made, in the light of the information made known, largely as a result of BALPA's effort subsequent to the accident, BALPA will remain dissatisfied and will continue its efforts to secure a full inquiry on the basis of the now known facts.

To all concerned, we re-state our claim that the truth should be officially recognized and that justice should be done. Finally we say: "Remember the R.101 investigation."

The British Air Line Pilots Association, Hayes, Middx. D. FOLLOWS, General Secretary.

TV Clanger Season Re-opens

WHERE on earth do the TV people get their historical facts from? Don't they get anyone who knows to check? The answer to that one is they clearly do not.

In a programme "Thirty Years After" on Jly. 29 about five minutes were devoted to aviation. In this they said George Stainforth won the 1931 Schneider Trophy when in fact it was won by John Boothman.

Then they said that in 1931 the first flight round the World was made by Post and Gatty. But in 1924 Lieuts. Lowell Smith and E. H. Nelson encircled the globe in 175 days. If they had devoted a whole hour to aviation I wonder how many more clangers they would have dropped!

Why don't the B.B.C. and ITV people consult those who have made air history their business and who have grown up with it? There are plenty of us left.

London, W.14. GEOFFREY DORMAN.

Groundabout

Technical Dept. An engineering report called "The Propaedeutics of Natural, Synthetic and Beneficiated Asbestos" reveals that natural fibrous amphiboles are crocidolite, richterite, anthophyllite and cummingtonite. Well may you say: "What—no fryingtonite?"

*

Infra Dignitary. It's worth being a member of the go-ahead Tiger Club (now 300 strong) just to get their lively news-letter "The Tiger Rag." The latest issue says of their newly acquired Stampe biplane that it can fly inverted for three minutes, "more than ample time to go red in the face." Following the club's traditionally diocesan naming of their specially modified Tigers—"The Bishop," "The Archbishop" and so on, after "Bish" Bishop, their aerobatic and venerable C.F.I.—the Stampe is to be called "Le Curé" and not, as the news-letter slyly suggests, "The Actress." And don't tell me you haven't heard of the equally venerable jokes which begin, or end, with "as the bishop said to the actress."

*

Bestest. The Americans, always eager to complicate, recently added "A" to "OK." to signify "All OK." You could see what the next move would be and sure enough it came up during the second U.S. manned rocket launching, when a commentator cried triumphantly "Everything's all AOK!"

*

"Sometimes I think they *build* the things blurred."

by Gren

Industry Record

Liquid Oxygen for the VC10

Progress with the VC10 continues, not only with the aircraft itself but with its associated systems. Preliminary flight trials of the Normalair 35-litre liquid oxygen converter for this aircraft have recently been completed with a unit installed in a Vanguard. The purpose of the trials was to check the converter's general performance and to assess the effect on turn-round time of using liquid oxygen equipment in commercial transports. Test results were, according to Normalair, in all respects satisfactory, indicating in particular that, when under full operational conditions, aircraft turn-round time will not be affected.

The VC10 will be the World's first civil transport in which emergency oxygen for passengers and crew is stored in liquid form. The converter selected is the largest produced by Normalair and incorporates an exclusive crew reserve system. Although both passenger and crew supplies are drawn from the same converter, an adequate supply for the crew is ensured at all times irrespective of passenger demand.

Operating features of the converter are high oxygen flows at a stable delivery pressure and low evaporation losses due to heat transfer.

Promoting Exports

To aid the expansion of its export business, Elliott-Automation, Ltd., has created a directorate of overseas operations. This is to be headed by Mr. Keith Newlands, lately sales director of Cossor Radar and Electronics, Ltd. The Group has 10 subsidiary companies operating overseas and over a wide field of its operations exports more than one third of its products.

Modelling Aid

R.A.E., Farnborough, has acquired an electronically controlled contour-grinding machine for use in the production of templates used in the manufacture of aerofoil sections for wind-tunnel models. The grinding machine is tape controlled by the EMICON system and the complete equipment was supplied by E.M.I. Electronics, Ltd. Precision Equipment, Ltd., were responsible for the grinder. The system is designed for an accuracy of ± 0.0005 in. on a template which may be up to 30 in. long.

The second fuelling development to come from Zwicky, Ltd., in recent weeks is a combined standpipe and bulk loading arm here seen in use with an R.A.F. Hippo tanker at a trial installation at Northolt.

Silicone Rubbers Approved

Five of the Silcoset silicone rubbers produced by the I.C.I. Nobel division have been given M.o.A. D.T.D.900 approval. This permits use of the compounds for caulking and sealing of aircraft, potting and encapsulation of electrical and electronic components and fabrication of silicone rubber components where D.T.D. 818 does not apply. The approvals are at present provisional. Full approval will be granted when inspection schedules and facilities are decided upon.

Fuel System Valve

Latest in valve development from the Hymatic Engineering Co., Ltd., is a dual inward/outward vent valve, the R.V.63, for use in the pressure control of fuel tank systems. Inward venting is controlled by a lightly spring-loaded diaphragm which normally operates in a dive so as to maintain a near-positive pressure during flight. Coaxially the outward relief valve is also spring loaded. This either operates during a climb or relieves excess pressure caused by temperature variations when an aircraft is standing on the ground.

For refuelling the vent is held fully open so as to cope with the high outward flow of air displaced by the incoming fuel—and to present the minimum restriction should fuel accidentally burst through the air vent because of delayed operation by the refuelling shut-off system. For this eventuality the outward relief vent is held in the fully open position by a piston, operated by pressure in the refuelling lines, which overrides the spring loading.

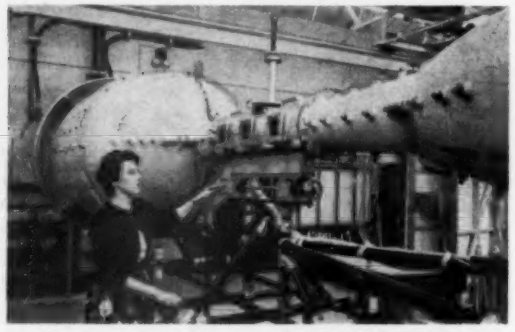
During inward venting the valve passes 20 cu. ft. per min. with a pressure drop of 0.3 p.s.i. at ground level. The outward relief vent has a nominal flow-off pressure of 3 p.s.i. and a 6 cu. ft. per min. air flow at 3.4 p.s.i. back pressure. The R.V.63 weighs 1¼ lb. and is fitted with 1½-in. beaded connections.

Wind Tunnel in Plastic

Recently brought into use at the English Electric Company's mechanical engineering laboratory at Whetstone, Leicester, is a small, low-speed wind tunnel for use principally in instrument calibration. Made from Bakelite polyester resin, reinforced with layers of woven glass cloth and chopped strand mat, it is one of a number made by the same method for use at Whetstone where it was designed. Construction was by English Electric's Rugby works.

The tunnel has a 4-ft. diameter inlet and an 8-in. diameter test section. A single-stage axial flow fan gives a maximum mean velocity of 250 ft. per sec. in the test section. Six instrument ports are moulded into it to accommodate either of two traverse gears. One gear is for calibrating the tunnel, allowing diametral traverses and yaw measurements. The other is for instrument calibration, permitting these to be rotated in yaw, pitch and roll.

The tunnel laminate was made in sections over wooden formers. Into the walls were moulded the static pressure taps together with ready tapped metal inserts for manometer connections.



Close-up of the 8-in. diameter working section of the Bakelite polyester resin wind tunnel used by English Electric for instrument calibration. The plastic pipes attached to the tunnel casing are for monitoring pressure distribution.

Aviation Calendar

Aug. 12

Doncaster.—Doncaster and District Gliding Club Open Day.

Aug. 16

Cambridge, Mass.—American Rocket Society and Air Force Office of Scientific Research International Hypersonics Conference; until Aug. 18.

Aug. 29

Luton Airport.—International Light Aircraft Exhibition; until Sept. 2.

Sept. 1

London.—B.I.S. lecture, "Man in Space," by Dr. J. C. Guignard, I. B. Wright and Dr. W. F. Hilton, at the Royal Society of Arts, John Adam Street, W.C.2, at 18.30 hr.

Sept. 3

Wolverhampton.—Wolverhampton Aero Club At Home.

Sept. 4

Farnborough.—S.B.A.C. Exhibition and Flying Display; until Sept. 10. (Public days Sept. 8-10.)

Sept. 8

Cranfield.—Popular Flying Association Rally; until Sept. 10.

Company Notices

INCREASES OF CAPITAL

Bristol Aeroplane Plastics, Ltd. (652,821), Stonebridge House, Colston Avenue, Bristol, 1.—Increased on Dec. 22, 1960, by £49,900 in £1 ordinary shrs., beyond the registered capital of £100.

Channel Air Bridge, Ltd. (621,729), 35 Piccadilly, W.1.—Increased on Jan. 10, 1961, by £99,000 in £1 ordinary shrs., beyond the registered capital of £1,000.

Executive Air Transport, Ltd. (670,302), 42-46 Hagley Road, Birmingham, 16.—Increased on Jan. 2, 1961, by £5,500 in 5s. ordinary shrs., beyond the registered capital of £500.

Gosford Tool and Equipment, Ltd. (526,653). (Manufacturers of jet turbine blades, tools and implements), 310-311 Broadgate House, Coventry.—Increased on Dec. 28, 1960, by £29,000 in £1 ordinary shrs., beyond the registered capital of £1,000.

Jet Blades and Engineering, Ltd. (525,848). (Manufacturers of jet turbine blades, tools and implements), 310-311 Broadgate House, Coventry.—Increased on Dec. 28, 1960, by £29,000 in £1 shrs., beyond the registered capital of £1,000.

New Patents

APPLICATIONS ACCEPTED

877,448.—**Blackburn Aircraft, Ltd.**—"Doors or closure members for bomb bays or like spaces in the fuselages of aircraft." Apr. 2, 1954.

877,505.—**Dowty Rotol, Ltd.**—"Aircraft undercarriages." May 22, 1959. (May 27, 1958.)

877,392.—**United States Atomic Energy Commission.**—"Nuclear propelled vehicle, such as a rocket." Feb. 17, 1960. (Mar. 3, 1959.)

877,449.—**Blackburn Aircraft, Ltd.**—"Electrical connection to electrically operated gear." Apr. 2, 1954.

877,602.—**R. A. Robert and P. P. Matge.**—"Casings for housing rocket-bombs suspended from an aircraft." Mar. 30, 1960. (Apr. 2, 1959.)

877,614.—**Vickers-Armstrongs (Aircraft), Ltd.**—"Releasable attachments." Aug. 27, 1959. (Sept. 5, 1958.)

Printed specifications of the above will be available on Sept. 13, 1961, and the opposition period will expire on Dec. 13, 1961.

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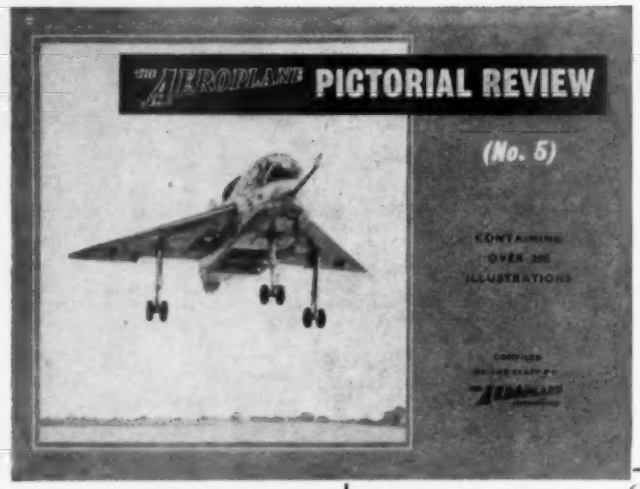

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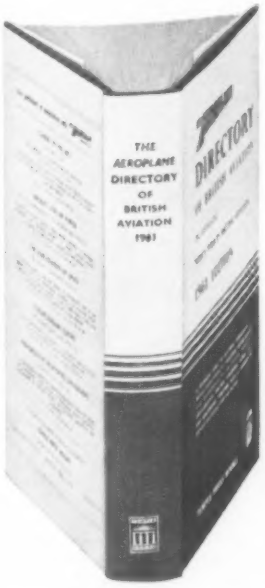

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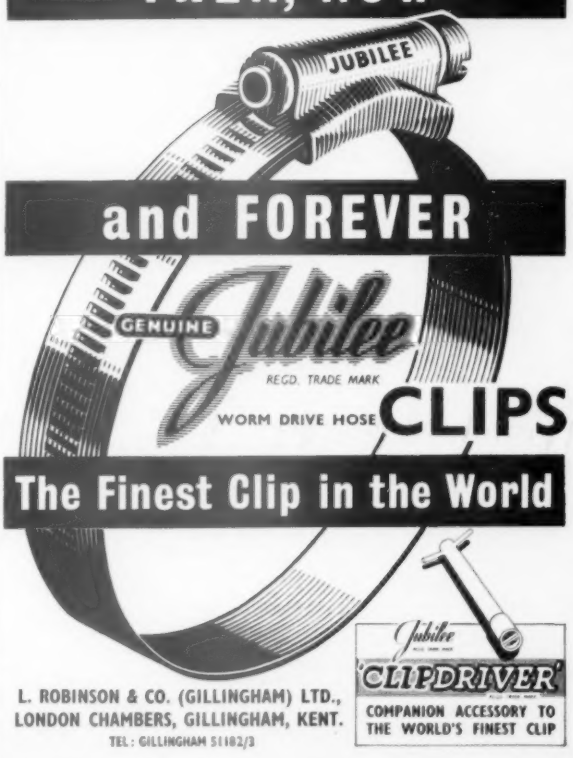

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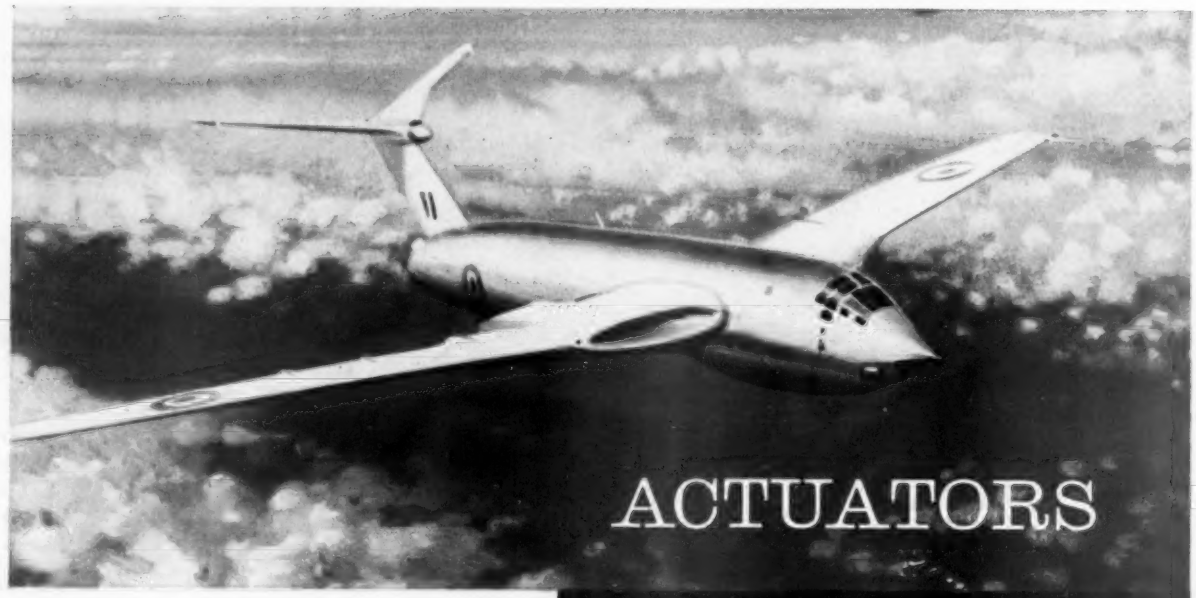

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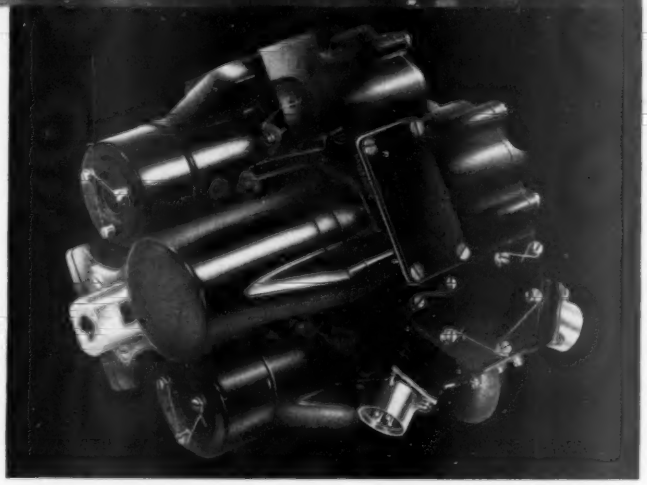

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